White Paper

We make sure

Integration of BX600 SB9 Switches in Cisco Networks

Issue 20th October 2006

Pages 47

Contents

1 Introduction 3
2 Switch Connectivity 4
2.1 Auto Negotiation 4
2.1.1 Introduction 4
2.1.2 Recommended Solution 4
2.1.3 Configuration 4
2.2 Port Aggregation 5
2.2.1 Introduction 5
2.2.2 Recommended Solution 5
2.2.3 Configuration 6
2.3 VLANs and Trunks 8
2.3.1 Introduction 8
2.3.2 Recommended Solution 8
2.3.3 Configuration 8
2.4 Spanning Tree Protocol 11
2.4.1 Introduction 11
2.4.2 Recommended Solution 15
2.4.3 Configuration with VLAN Trunks 15
2.4.4 Configuration without VLAN Trunks 20
2.5 Access Port and NIC Configuration 24
2.5.1 Introduction 24
2.5.2 Recommended solution 24
2.5.3 Configuration 25
2.6 Link State 31
2.6.1 Introduction 31
2.6.2 Recommended Solution 31
2.6.3 Configuration 31
3 Basic Multicast Services 32
3.1 Introduction 32
3.2 Recommended solution 32
3.3 Configuration 32
4 Switch Management 35
4.1 Logging and Synchronization 35
4.1.1 Introduction 35
4.1.2 Recommended Solution 35
4.1.3 Configuration of syslog and SNTP 35
4.2 SNMP 37
4.2.1 Introduction 37
4.2.2 Recommended Solution 37
4.2.3 Configuration of SNMP 37
4.3 Remote Console Access 38
4.3.1 Introduction 38
4.3.2 Recommended Solution 38
4.3.3 Configuration of SSH 38
4.4 Integration into Radius and TACACS+ 39
4.4.1 Introduction 39
4.4.2 Recommended Solution 39
4.4.3 Configuration of RADIUS 39
4.4.4 Configuration of TACACS 43
4.5 Cisco Discovery Protocol 46

4.5.1 Introduction 46
4.5.2 Recommended Solution 46
4.5.3 Configuration of CDP 46
4.6 Port Monitoring 47
4.6.1 Introduction 47
4.6.2 Configuration of Port Monitoring 47
4.7 Further information in the Internet: 47

1 Introduction

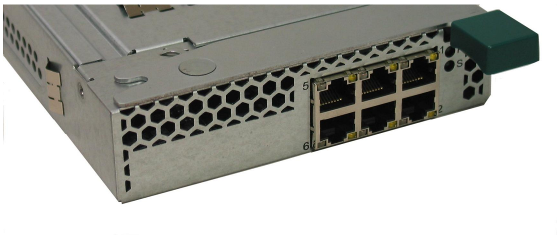
Today most datacenter networks run with switches from a single vendor. Although most of the protocols used are standardized, there are a number of proprietary ones – especially redundancy and management protocols. Other features may be so individual that interoperability is possible but not simple.
It is therefore sometimes a challenge to integrate switches from one vendor into a network that has been build using a different vendor. This paper is intended to guide the reader with the task of integrating BX600 SB9 switches into Cisco networks.
A number of major aspects that are common to most datacenter networks are covered and have been tested in Fujitsu Siemens' laboratories. All the features of Cisco switches mentioned in this paper have been tested with Catalyst 3560 and Catalyst 3750 series switches.

The following Cisco IOS software was used for the integration tests:

Catalyst 3750	IOS 12.2(25)SEE1	Advanced IP Services
Catalyst 3560	IOS 12.2(25)SEE1	Advanced IP Services

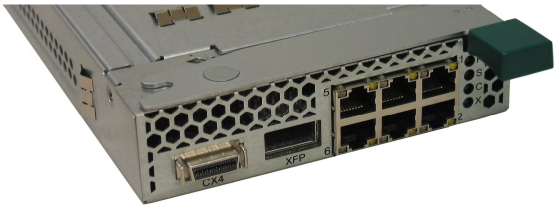
The PRIMERGY BX600 GbE switch is an integrated Gigabit Ethernet switch for use in the PRIMERGY BX600 chassis. Up to four switches can be installed, and each installed switch offers ten 1Gbit downlink ports to the midplane for connection to server blades. The PRIMERGY GbE switch comes in two variants as regards the external ports: one with six 1 Gbit uplink ports (RJ45), and one with six 1 Gbit uplink ports and two 10 Gbit uplink ports (XFP, CX4). The two 10 Gbit ports of the second variant can be connected by means of an XFP module and a CX4 cable. Layer 2/3/4 functionalities are supported.

PRIMERGY BX600 GbE switch variant 1:



- **Six 1 Gbit/s Ethernet RJ45 ports**

PRIMERGY BX600 GbE switch variant 2:



- **Six 1 Gbit/s Ethernet RJ45 ports**
- **Two 10 Gbit/s Ethernet ports (XFP, CX4)**
- **Infiniband cable 10m (10GBASE-CX4) must be ordered separately**
- **XFP multimode module (10GBASE-SR) must be ordered separately**

2 Switch Connectivity

2.1 Auto Negotiation

2.1.1 Introduction

The SB9 is equipped with at least six Gigabit Ethernet ports which are implemented as specified in the 1000BaseT standard. (Since ten Gigabit Ethernet is not usual in datacenters' server access layer, the 10GBaseCX4 and XFP interfaces that are also available are not covered here.)

These ports can be run with different data rates and different duplex settings comparable to Cisco Switches. Table 1 shows the possible combinations of a Cisco Switch and an SB9. Only the combinations marked green are viable: the combinations marked red are risky because they will lead to a duplex failure.

		SB9				
		Fix Half Duplex 10	Fix Half Duplex 100	Fix Full Duplex 10	Fix Full Duplex 100	Auto
Cisco Switch	Fix Half Duplex 10	Ok	N/A	BAD	N/A	Ok
	Fix Half Duplex 100	N/A	Ok	N/A	BAD	Ok
	Fix Full Duplex 10	N/A	N/A	Ok	N/A	BAD
	Fix Full Duplex 100	N/A	BAD	N/A	Ok	BAD
	Fix Full Duplex 1000	N/A	N/A	N/A	N/A	Ok
	Auto	Ok	Ok	BAD	BAD	Ok

Table 1 : Speed and Duplex Settings

During the ports' autonegotiation phase the flow control mechanism can also be negotiated. Switches are not the best location for buffering packets during congestion; this mechanism should therefore not be activated on links between switches but preferably between servers and switches. In this case the server would be able to buffer the packets if the switch were to detect congestion on the uplink. Since flow control depends very much on the server hardware and software, this issue is not covered in this paper.

2.1.2 Recommended Solution

We recommend setting the ports on both sides to auto negotiation. In this setting the switches will negotiate their capabilities and will find the best possible setting. When connected to the usual 1000BaseT port of a Cisco switch using a crossover or straight thru 8 wire Cat5E, or (better) a patch cable, the SB9 will negotiate 1000 Mbit with full duplex.

Flow control should be disabled between switches.

2.1.3 Configuration

You set a port of the SB9 (e.g. 0/12) to auto negotiation and no flow control by entering the following commands in configuration mode:

```
interface 0/12
 negotiate
 no storm-control flowcontrol
exit
```

Here is the corresponding Cisco configuration:

```
interface GigabitEthernet0/2
 speed auto
 duplex auto
 flowcontrol receive off
end
```

2.2 Port Aggregation

2.2.1 Introduction

You will usually need more than 1 Gbit when connecting an SB9 switch in a datacenter. In this case two or more links are set up to form a port-channel, also known as a Fast Ethernet Channel (FEC) or Gigabit Ethernet Channel (GEC) in Cisco networks. Figure 1 shows a typical uplink configuration for an SB9: One port-channel connects to Cisco switch A and a second one connects to Cisco switch B. Each port-channel is formed of two links running with 1000 Mbit in full duplex mode. The redundancy mechanisms between these links will be discussed later. In principle, port-channels can be configured statically or using a port aggregation protocol. Cisco supports LACP as specified in 802.3ad and their proprietary PagP, while the SB9 supports LACP as specified in 802.3ad.
Using static or LACP dynamic configuration, you can form up to six GE links between the SB9 and one other switch.

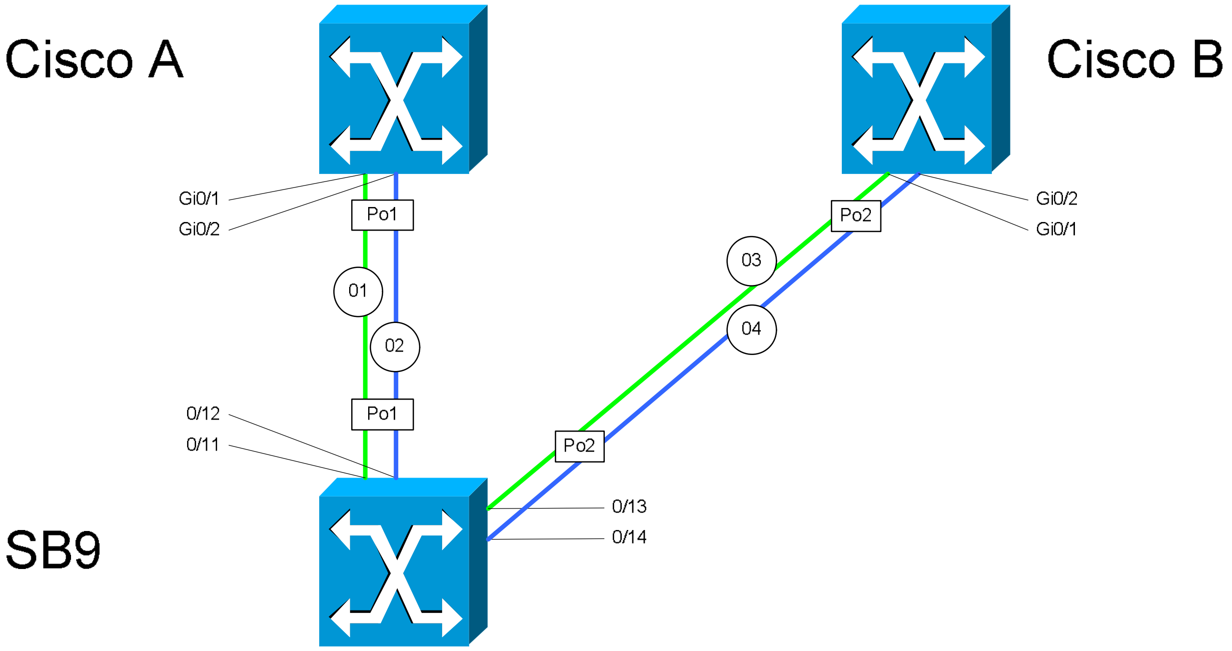


Figure 1 : Typical uplink configuration for SB9

Table 2 shows the possible combinations of port-channel settings between SB9 and Cisco switches. The combinations marked red are very risky and would lead to networks loops.

		SB9		
		No Channel	LACP	Static
Cisco	No channel	OK	OK	!!!
	Active	OK	OK	!!!
	Passive	OK	OK	!!!
	On	!!!	!!!	OK

Table 2 : Possible port-channel configurations

So called “split channels”; where one channel from one switch is terminated at two other switches; are supported neither by the SB9 nor by Cisco switches.

2.2.2 Recommended Solution

Although Cisco switches and SB9 both support LACP, and although this feature has been tested to be compatible between these devices, we recommend using static configured trunks. This is the best practice to minimize the risk of incompatibilities and misconfigurations.

Caution: **In order to avoid loops in the network, please be sure that the affected ports of a port-channel are shut down during the configuration process. Generating loops in a datacenter network may cause serious network problems!**

2.2.3 Configuration

The setup in Figure 1 would be configured in the following steps:

- Step 1: Shut down the affected ports to avoid loops
- Step 2: Set up the port-channel
- Step 3: Bring up the affected ports
- Step 4: Verify the operation of the port-channels

Step 1: Shut down the affected ports to avoid loops

```
! SB9
interface range 0/11 – 0/14
 shutdown
exit
```

```
! Cisco A
interface range Gi 0/1 – 2
 shutdown
end
```

```
! Cisco B
interface range Gi 0/1 – 2
 shutdown
end
```

Step 2: Set up the port-channel

```
! SB9
port-channel Po1
 interface 1/1
exit

port-channel Po2
 interface 1/2
exit

interface range 0/11 – 0/12
 channel-group 1/1
exit

interface  0/13 – 0/14
 channel-group 1/2
exit

interface 1/1
 ! static configuration – no LACP
 staticcapability
exit

interface 1/2
 ! static configuration – no LACP
 staticcapability
exit

end
```

```
! Cisco A
interface Port-channel1
!
interface range Gi 0/1 - 2
 channel-group 1 mode on
end
```

```
! Cisco B
interface Port-channel2
!
interface range Gi 0/1 - 2
```

```
 channel-group 2 mode on
end
```

Step 3: Bring up the affected ports

```
! SB9
interface range 0/11 – 0/14
 no shutdown
exit
end
```

```
! Cisco A
interface Po 1
 no shutdown
end
```

```
! Cisco B
interface Po 2
 no shutdown
end
```

Step 4: Verify the operation of the port-channels

```
! SB9
(SB9) #show port-channel

Logical Interface Port-Channel Name Link State Mbr Ports  Active Ports
----------------- ----------------- ---------- ---------- ------------
1/1               Po1               Up         0/11,0/12   0/11,0/12
1/2               Po2               Up         0/13,0/14   0/13,0/14
```

```
! Cisco A
Cisco-A#show etherchannel summary
Flags:  D - down        P - in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3      S - Layer2
        U - in use      f - failed to allocate aggregator
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port


Number of channel-groups in use: 1
Number of aggregators:           1

Group  Port-channel  Protocol    Ports
------+-------------+-----------+----------------------------------------------
1      Po1(SU)          -        Gi0/1(P)   Gi0/2(P)
```

```
! Cisco B
Cisco-A#show etherchannel summary
Flags:  D - down        P - in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3      S - Layer2
        U - in use      f - failed to allocate aggregator
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port


Number of channel-groups in use: 1
Number of aggregators:           1

Group  Port-channel  Protocol    Ports
------+-------------+-----------+----------------------------------------------
1      Po1(SU)          -        Gi0/1(P)   Gi0/2(P)
```

2.3 VLANs and Trunks

2.3.1 Introduction

Most network administrators want to partition their network into multiple broadcast domains to provide better network stability and better information security. This is implemented using virtual LAN technology (VLANs) which provides multiple virtual LAN segments in one switched network domain as specified in the standard 802.1Q.
A number of protocols have been developed to simplify the management of such VLANs. While Cisco uses its own proprietary VLAN Trunking Protocol (VTP), the IEEE describes the GARP VLAN Registration Protocol (GVRP) which has been implemented in the SB9.

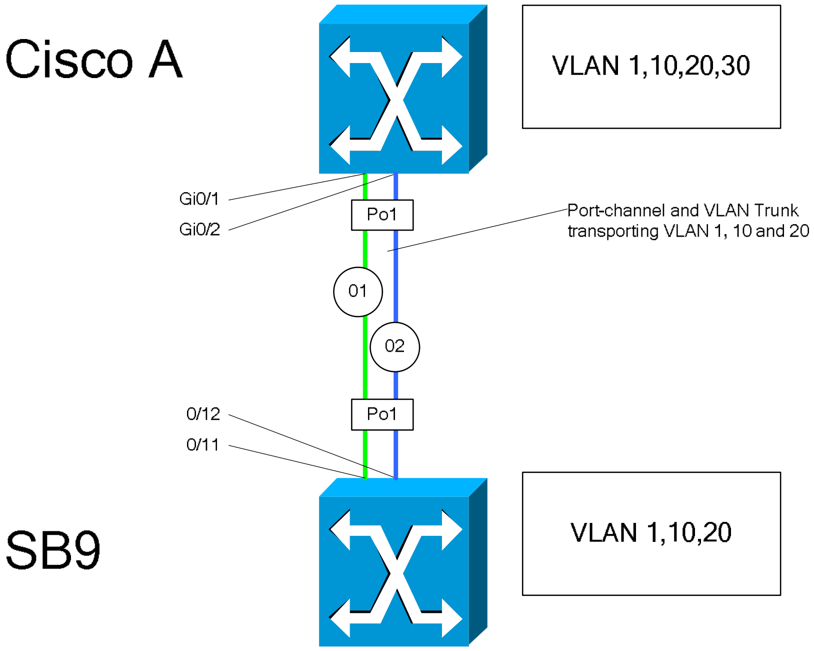


Figure 2 : VLAN Trunk between SB9 and Cisco Switch

When multiple switches are interconnected there is often a need to transport multiple VLANs over one line. This technique is called VLAN Trunking and is described in the IEEE standard 802.1Q and implemented in the SB9. Some older Cisco switches implement a proprietary and incompatible ISL, but all devices found in modern datacenters will support 802.1Q trunks. Figure 2 shows a typical setup between a Cisco and an SB9 switch, whereby a port-channel is combined with a VLAN trunk.

It is important to know the role of the so-called native VLAN on an 802.1Q trunk. All the packets on the trunk are encapsulated in 802.1Q packets, which means that a header containing the VLAN number and certain other information is added to the packet before it is transported over the trunk. Only the packets of the native VLAN are untagged for a variety of reasons. In most installations, VLAN1 is configured as native VLAN which is used for a number of protocols, such as VTP, CDP, STP, etc.

2.3.2 Recommended Solution

Cisco's VTP and standard GVRP are not compatible. Since a VLAN registration protocol is useful only when applied to several switches within a switch domain, GVRP is not recommended in a Cisco environment.
A number of features of the current version V 2.0 make it neither usual nor advisable to use VTP in datacenter networks:

- The design of the VTP server and client concept is extremely delicate: if you bring in a VTP client switch with a higher configuration version number than the rest of the network, all the switches will copy the VLAN database from this switch. This will be a disaster if the new switch has been used in a laboratory and one or more VLANs had been deleted in the meantime.
- Manual trunk configuration is very deterministic as to which VLAN is on which trunk. This will simplify troubleshooting.
- Manual trunk configuration may help the administrator to set up a simple load sharing.

We therefore recommend using manual VLAN registration in a Cisco datacenter network.

Since the SB9 does not support ISL, the only solution for VLAN trunks to Cisco switches is IEEE 802.1Q. When STP is used, which is the case for most of datacenters, it is necessary to use a native VLAN because the standard defines that BPDUs have to be transported untagged. (See also Spanning Tree)

Cisco recommends not using VLAN 1 for anything productive. It therefore makes sense to configure the management IP address of the SB9 into another VLAN, but it is nevertheless important to have one native VLAN defined on the trunk.

2.3.3 Configuration

You set up a VLAN trunk as shown in Figure 2 and our recommendations by performing the following steps:

- Step 1: Configure the port-channels
- Step 2: Define the VLANs
- Step 3: Configure VLAN trunk
- Step 4: Verify the VLAN trunk

Step 1: Configure the port-channels
Please refer chapter 2.2

Step 2: Define the VLANs

```
! SB9
! Configure the VLANs (VLAN 1 is default and can’t be configured
vlan database
vlan  10
vlan name 10 VLAN-10
vlan  20
vlan name 20 VLAN-20
exit
```

```
! Cisco-A
! Configure the VLANs (VLAN 1 is default and can’t be configured
vlan 10
 name VLAN-10
!
vlan 20
 name VLAN-20
!
vlan 30
 name VLAN-30
```

Step 3: Configure VLAN trunk

```
! SB9
! Definition of the port-channel
port-channel Po1
 interface 1/1
exit
interface  0/11
 channel-group 1/1
exit
interface  0/12
 channel-group 1/1
exit

! Configure the interfaces for VLAN trunking
!
interface range 0/11 – 0/12
 ! the native vlan 1 is default and normally not displayed in configuration
 switchport native vlan 1
 switchport allowed vlan add 10
 switchport tagging 10
 switchport allowed vlan add 20
 switchport tagging 20
exit

! Configure the port-channel for VLAN trunking
!
interface  1/1
 staticcapability
 ! the native vlan 1 is default and normally not displayed in configuration
 switchport native vlan 1
 switchport allowed vlan add 10
 switchport tagging 10
 switchport allowed vlan add 20
 switchport tagging 20
exit
```

```
! Cisco-A

interface Port-channel6
 switchport trunk native vlan 1
 switchport trunk encapsulation dot1q
 switchport mode trunk
 switchport allowed vlan 1,10,20
!
interface range GigabitEthernet0/1 - 2
 ! the native vlan 1 is default and normally not displayed in configuration
 switchport trunk native vlan 1
 switchport trunk allowed vlan 1,10,20
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 6 mode on
!
```

Step 4: Verify the VLAN trunk

```
! SB9
(bx6-sb9-a) #show vlan


VLAN ID VLAN Name                        VLAN Type         Interface(s)
------- ----------------------------- ---------- -------------------------
1       Default                           Default    0/4,0/5,0/6,0/7,0/8,0/9,
                                                     0/10,0/11,0/12,0/13,0/15,0/16,
                                                     1/1,1/2
10      VLAN-10                           Static     0/1,0/11,0/12,0/13,0/14,0/15,
                                                     0/16,1/1,1/2
20      VLAN-20                           Static     0/2,0/11,0/12,0/13,0/14,0/15,
                                                     0/16,1/1,1/2
(bx6-sb9-a) #show interface switchport 1/1

          Port    Acceptable   Ingress             Default
Interface VLAN ID Frame Types  Filtering    GVRP   Priority
--------- ------- ------------ ----------- ------- --------
1/1       1       Admit All    Disable     Disable     0

(bx6-sb9-a) #
```

```
! Cisco-A
Cisco-A# show interface trunk

Port        Mode         Encapsulation  Status        Native vlan
Po1         on           802.1q         trunking      1

Port        Vlans allowed on trunk
Po1         1,10,20

Port        Vlans allowed and active in management domain
Po1         1,10,20

Port        Vlans in spanning tree forwarding state and not pruned
Po1         1,10,20
```

2.4 Spanning Tree Protocol

2.4.1 Introduction

When the only standard for spanning tree protocols in LANs was STP, as specified in 802.1D, Cisco developed a number of proprietary protocol enhancements. Some of these were adopted into the RSTP standard but others were not. Cisco therefore also modified their RSTP implementation to be compatible with their enhanced STP. Table 3 shows all current STP implementations.

STP 802.1D	STP as specified in 802.1D. Slow convergence, does not support multiple instances for VLAN trunks.	SB9: conforms to the standard Cisco: supported only on access ports not on trunks.
RSTP 802.1w	Rapid STP as specified in 802.1w. Fast convergence, does not support multiple instances for VLAN trunks.	SB9: conforms to the standard Cisco: supported only on access ports not on trunks.
MSTP 802.1s	Multiple Instance STP as specified in 802.1s. Fast convergence, support multiple instances for VLAN trunks	SB9: conforms to the standard Cisco: conforms to the standard but not common in Cisco environments
PVST+	STP as specified in 802.1D with the following enhancements: • port-fast feature • uplink-fast feature • backbone-fast features • spanning tree for each VLAN Fast convergence, compatible to 802.1D even on VLAN trunks.	Cisco: proprietary solution SB9: not supported yet
PVST	Like PVST+ but supporting only ISL trunks	Cisco: proprietary solution
RAPID-PVST	RSTP as specified in 802.1w with the following enhancements: • spanning tree for each VLAN Fast convergence, compatible to 802.1D even on VLAN trunks.	Cisco: proprietary solution SB9: not supported yet

Table 3 : Spanning tree protocol implementations

When connecting switches without VLAN trunks, PVST+ and STP are compatible with RSTP and RAPID-PVST respectively without any problems. Other combinations are discussed in the following section.

Running ST P 802.1D with PVST+ on VLAN Trunks

When running STP over VLAN trunks, MSTP is the only STP protocol implemented by Cisco that completely complies with the IEEE standard. This is unfortunately not usually used in datacenter networks, where PVST+ and RAPID-PVST are more common.

Unlike 802.1D, in which only one STP instance is used to control the STP state of the trunk, PVST+ runs one STP instance per VLAN, sends BPDUs and maintains one STP state per VLAN on a trunk. In addition to this major deviation from the standard, Cisco added a number of minor changes, such as the port-fast, uplink-fast and backbone-fast features, which have only local effects and do not limit their interoperability.

PVST+ is also compatible to STP as specified in 802.1D when there is a native VLAN on the trunk. Figure 3 shows a scenario in which two Cisco switches are running PVST+ and an SB9 is running STP as specified in 802.1D.

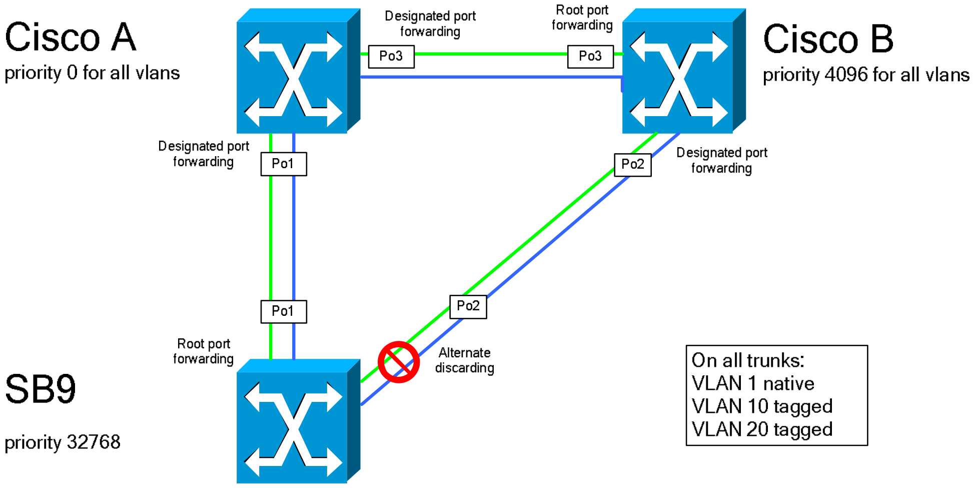


Figure 3 : Combining PVST+ and 802.1D

Switch A is configured as root bridge, while switch B will take over the root role when A fails. Since switch A sends untagged BPDUs from VLAN 1 to Po1, the SB9 uses Po1 as root port. Po2 of SB9 will take on port role “alternate” and will be in the state “discarding” and will not send any BPDUs at this port. Switch B will therefore also set its port Po2 to “designated” and “forwarding”. The SB9 takes all decisions as indicated by the BPDUs in VLAN 1, and all other BPDUs will be ignored. It is therefore important that one native VLAN is defined at both VLAN trunks. Cisco recommends that this native VLAN should be the same for both trunks to the SB9.

If the Po1 link or switch A itself fails, the SB9 will change the role of Po2 to “designated” and its state to “forwarding”, after going through the state “learning”. According to the standard this will lead to a failover time of approximately twice the forward delay, which in normal cases will be about 30 seconds. Depending of the size of the network this time can be reduced by tuning the STP timers, but this must be done very carefully in order to provide a stable network. Please refer the standard 802.1D or Cisco’s recommendations for timer tuning.

When the SB9 is running 802.1D it supports features such as Cisco’s proprietary port-fast when the “spanning-tree edgeport” command is applied. This means that an access port will take on the state “forwarding” and will omit the states “listening” and “learning”. This is needed when PXE boot mechanisms are used.

Running PVST+ on VLAN Trunks while disabling STP at the SB9

When STP is disabled at the SB9 it bridges the BDPUs without any modifications. Figure 4 shows this scenario.

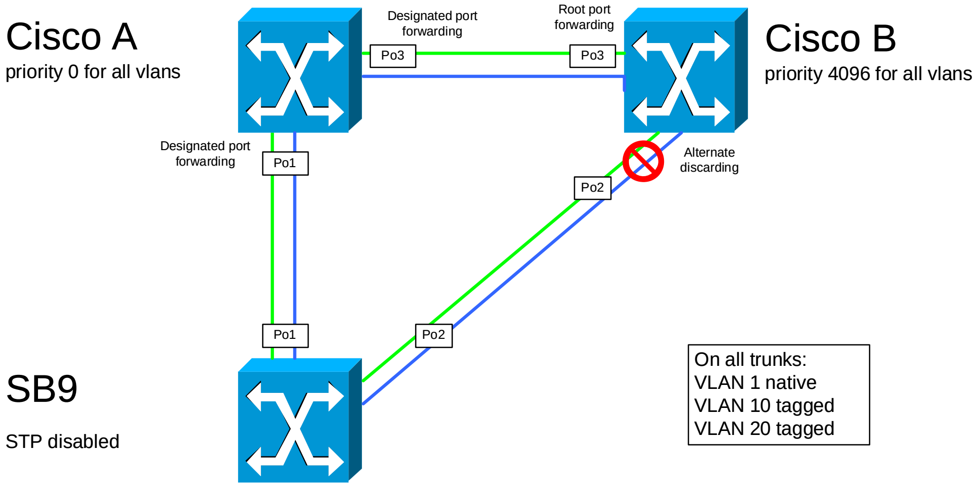


Figure 4 : PVST+ while STP is disabled at SB9

Since switch B receives the BPDUs of switch A, its port Po2 will get the role “alternate” and it will take on the state “discarding”. The SB9 will not be involved in any decisions while the topology is changing.

If the link Po1 fails, switch B will not receive any BPDUs at Po2. After three times the “hello” interval, Po2 will initiate its change to the role “designated” and will subsequently take on the “forwarding” state. Since no STP is enabled at the SB9, all the switch’s ports will be enabled and forwarding as soon as they come up.

Without STP timer tuning, worst-case failover times resulting from link or switch failures were found to be approximately 45 seconds.

Rapid Spanning Tree

The standard IEEE 802.1w (RSTP) defines only BPDUs in the native VLAN as implemented by the SB9. Cisco also enhanced RSTP to RAPID-PVST which is compatible to RSTP in a number of ways. Figure 5 shows this scenario.

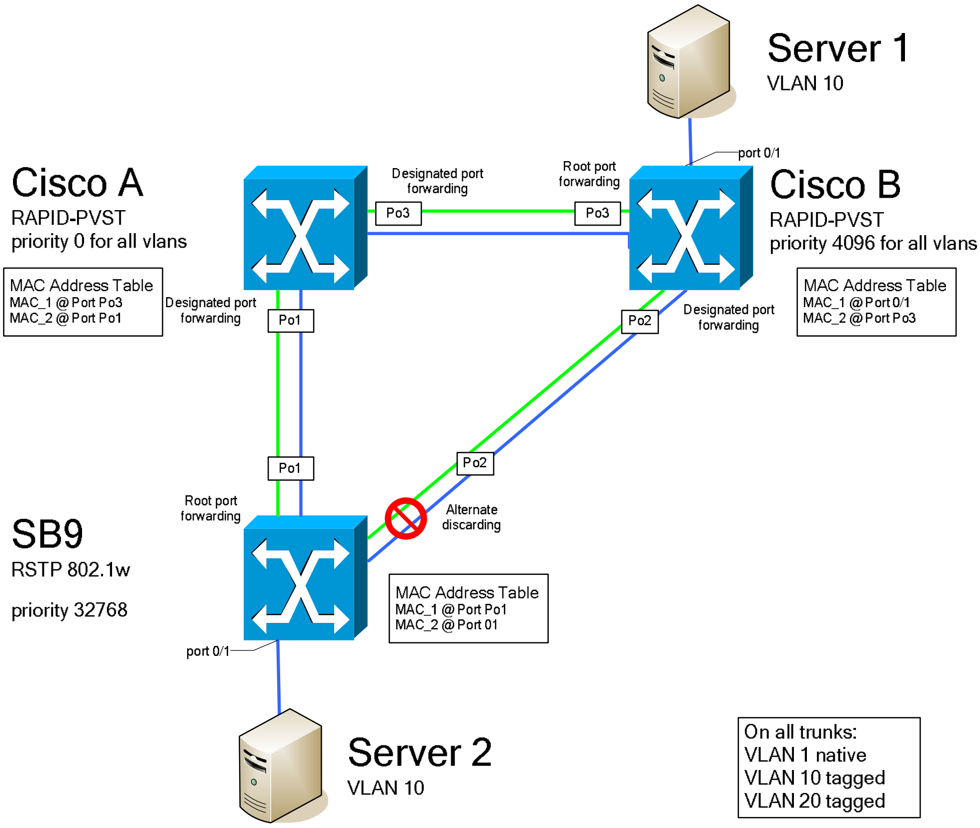


Figure 5 : Combining RAPID-PVST and 802.1w

All RSTP features are functioning for the native (in this example VLAN1). Since the SB9 implements the standard, and does not know about tagged BPDUs, RAPID-PVST has the same restrictions as PVST+.
There is an additional problem due to the fact that RSTP generates a Topology Change Notification (TCN) only when changing a port to the state “designated”. If the Po1 link in Figure 5 fails, port Po1 of switch A will go down and will not generate a TCN as specified in 802.1w. SB9 will change the role of port Po2 to root port and its state to “forwarding” and will generate a TCN as specified in 802.1w on the native VLAN. This has the effect that the Cisco switches will flush their MAC address tables of VLAN 1 but not for the other VLANs.

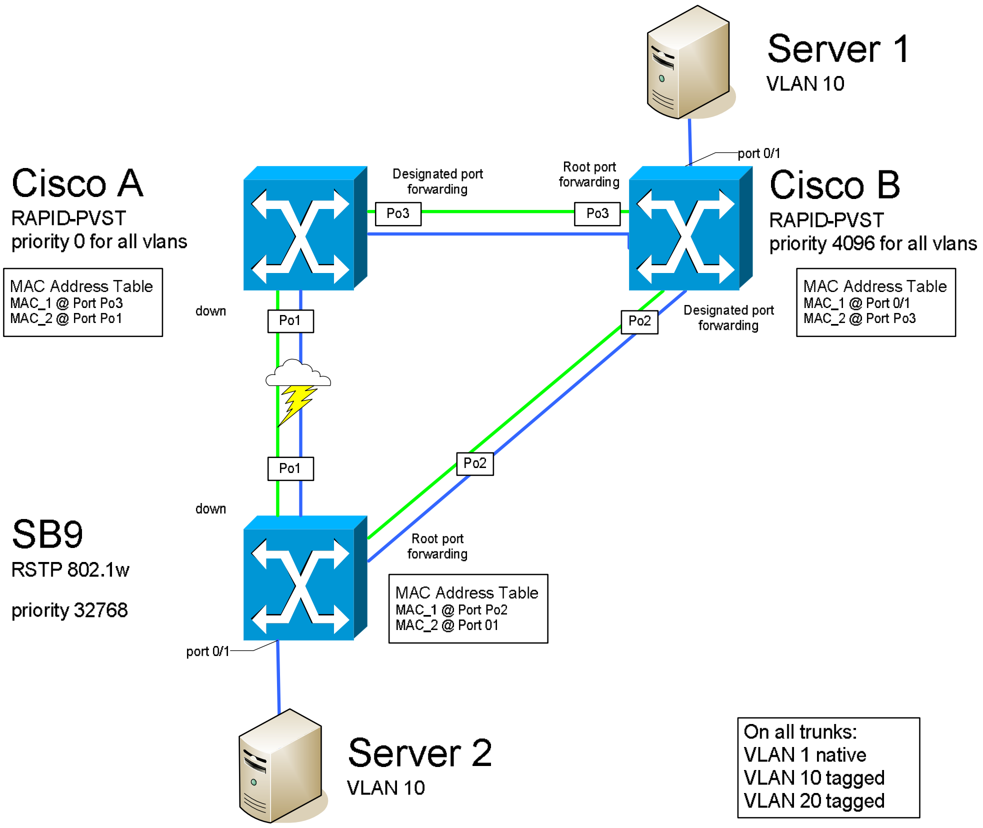


Figure 6 : Combining RAPID-PVST and 802.1w after failure of Po1

Figure 6 shows this scenario. When server 1 now wants to send data to server 2, switch B will send it to switch A via Po3 (as indicated by the MAC address table), which has no connection to the SB9 and will drop the packet. This will not change until either the MAC address table entry times out (after ~300 seconds) or the server SB9 sends a packet that has been seen by switch B, whichever happens first.
This scenario shows that RSTP and RAPID-PVST are not compatible in this respect. A worst-case failover time of 300 sec will not be acceptable.

Running RAPID-PVST on VLAN Trunks while disabling STP at the SB9

When RAPID-PVST is running at the Cisco switches and STP is disabled at the SB9 we have almost the same scenario as above, where the Cisco switches were running STP and STP was disabled at the SB9. Figure 7 shows this scenario.

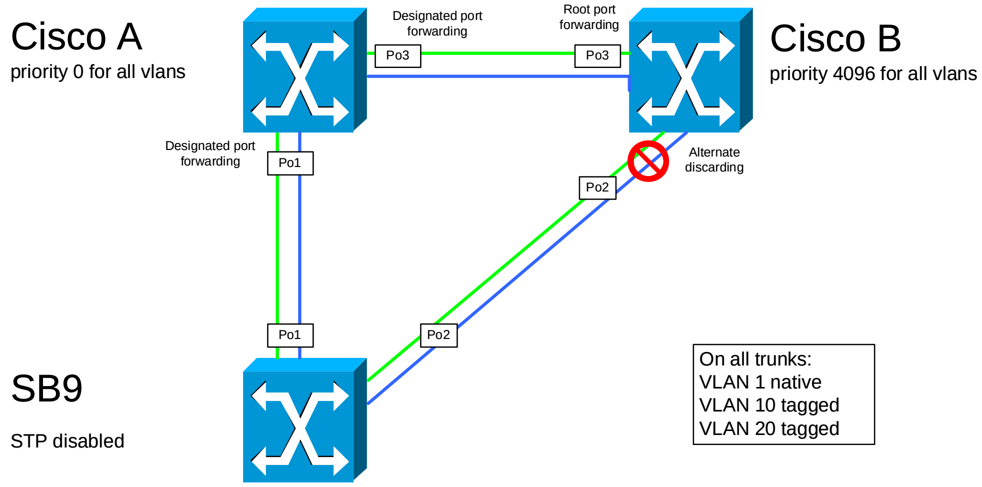


Figure 7 : RAPID-PVST while STP is disabled at SB9

When the Po1 link fails, the Po2 of switch B will stop receiving BPDUs. After three times the “hello” interval, the switch will change the state of port Po2 to “learning” and will then follow the normal state machine so that the convergence time is the same as with 802.1D.
Since the RSTP cannot operate with the proposal/agreement mechanism on this link, root changes will also be relatively slow within all the VLANs that are running on the trunks to the SB9.

2.4.2 Recommended Solution

As discussed earlier, there are a number of different combinations of STP protocols that can be selected when integrating SB9 switches into Cisco networks. Although using MSTP between the Cisco and the SB9 would be the best solution, it will not be discussed further in this paper because MSTP is so very unusual in Cisco networks. If you were to run MSTP (802.1s) on the SB9 switches while using STP or RSTP at the Cisco switches, MSTP would fall back to RSTP and STP respectively.

The resulting and possible solutions are shown in Table 4.

		SB9 Switch		
		802.1D	802.1w	No STP
Cisco Switch	PVST+	Ok*	Ok	Ok
	RAPID-PVST	with restrictions (Problems with TCN)	with restrictions (Problems with TCN)	Ok

Table 4 : Possible STP combinations when using VLAN Trunks

* SB9 firmware >1.14 required

The recommended solution when running STP over VLAN trunks between Cisco and SB9 switches is to disable STP completely at the SB9 and run the STP or RSTP protocol at the Cisco switches (see Figure 4 and Figure 7).

When the SB9 is connected to Cisco switches without VLAN trunks, the preferred solution is RSTP, because this would lead to the shortest failover times.

Caution: **In order to avoid loops in the network, please be sure that the VLAN configuration on both uplinks is the same. Misconfiguration may lead to unidirectional links and to network loops!**

Caution: **There is a significant difference between disabling STP on the SB9 globally and for each interface:**

If STP is disabled for one interface BPDUs are neither sent nor bridged. This behavior may lead to network loops.
When STP is disabled globally BPDUs are bridged. This is needed in the recommended scenarios.

Caution: **When running STP on an SB9 it is important to enable STP at all ports, especially when creating port-channels: this is not the default and must be enabled manually.**

2.4.3 Configuration with VLAN Trunks

You set up the scenario shown in Figure 8 by performing the following steps:

- Step 1: Configure the switches
- Step 2: Verify the configuration

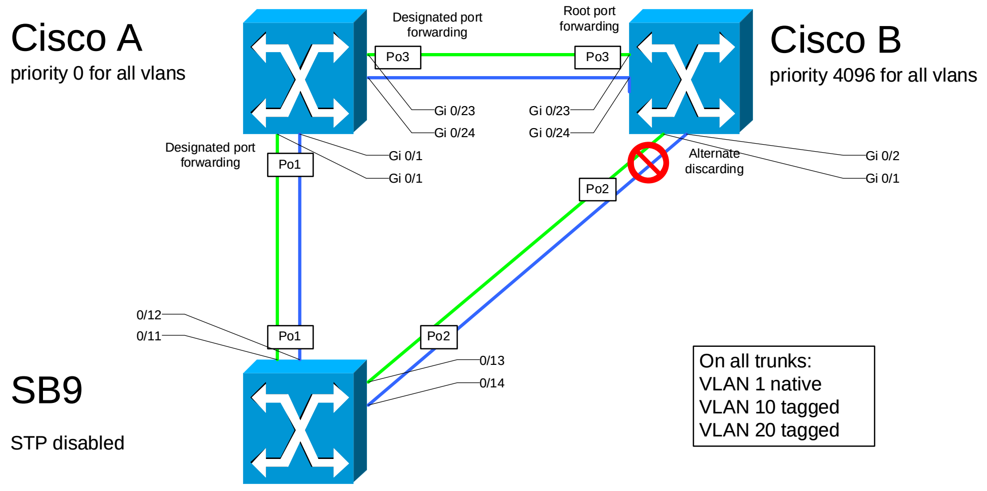


Figure 8 : Configuration example RAPID-PVST while STP is disabled at SB9

Step 1: Configure the switches

```
! SB9 configuration
!
! Disable STP for the whole switch
! (This command is normally not displayed)
no spanning-tree
```

```
! Define the VLANs
vlan database
vlan  10
vlan name 10 VLAN-10
vlan  20
vlan name 20 VLAN-20
exit

! Definine the port-channels
port-channel Po1
interface 1/1
exit
interface  0/11
channel-group 1/1
exit
interface  0/12
channel-group 1/1
exit
port-channel Po2
interface 1/2
exit
interface  0/13
channel-group 1/2
exit
interface  0/14
channel-group 1/2
exit

! Configure the interfaces
interface range 0/11 – 0/14
spanning-tree port mode
switchport allowed vlan add 10
switchport tagging 10
switchport allowed vlan add 20
switchport tagging 20
exit

interface  1/1
staticcapability
spanning-tree port mode
switchport allowed vlan add 10
switchport tagging 10
switchport allowed vlan add 20
switchport tagging 20
exit

interface  1/2
staticcapability
spanning-tree port mode
switchport allowed vlan add 10
switchport tagging 10
switchport allowed vlan add 20
switchport tagging 20
exit
end
```

```
! Cisco Switch A

! Enable and configure RSTP
spanning-tree mode rapid-pvst
spanning-tree vlan 1,10,20 priority 0
!
! Timers are tuned. Please refer Cisco documentation before
! using this part of the configuration
!
spanning-tree vlan 1,10,20 hello-time 1
spanning-tree vlan 1,10,20 forward-time 8
spanning-tree vlan 1,10,20 max-age 11
!
vlan 10
```

```
 name VLAN-10
!
vlan 20
 name VLAN-20

! Define the port-channels
!
interface Port-channel1
switchport trunk encapsulation dot1q
 switchport mode trunk
!
interface Port-channel3
 switchport trunk encapsulation dot1q
 switchport mode trunk
!
interface GigabitEthernet0/1
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 1 mode on
!
interface GigabitEthernet0/2
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 1 mode on

interface GigabitEthernet0/23
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 3 mode on
!
interface GigabitEthernet0/24
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 3 mode on
```

```
! Cisco Switch B

! Enable and configure RSTP
spanning-tree mode rapid-pvst
spanning-tree vlan 1,10,20 priority 4096
!
! Timers are tuned. Please refer Cisco documentation before
! using this part of the configuration
!
spanning-tree vlan 1,10,20 hello-time 1
spanning-tree vlan 1,10,20 forward-time 8
spanning-tree vlan 1,10,20 max-age 11
!
vlan 10
 name VLAN-10
!
vlan 20
 name VLAN-20

! Define the port-channels
!
interface Port-channel2
switchport trunk encapsulation dot1q
 switchport mode trunk
!
interface Port-channel3
 switchport trunk encapsulation dot1q
 switchport mode trunk
!
interface GigabitEthernet0/1
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 2 mode on
!
interface GigabitEthernet0/2
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 2 mode on

interface GigabitEthernet0/23
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 3 mode on
!
interface GigabitEthernet0/24
 switchport trunk encapsulation dot1q
 switchport mode trunk
 channel-group 3 mode on
```

Step 2: Verify the configuration

```
! Check if STP is diabled @ SB9
!
(bx6-sb9-a) #show spanning-tree summary

Spanning Tree Adminmode........... Disabled
Spanning Tree Version............. IEEE 802.1d
Configuration Name................ Default
Configuration Revision Level...... 0
Configuration Digest Key.......... 0xac36177f50283cd4b83821d8ab26de62
Configuration Format Selector..... 0
No MST instances to display.

! Check port-channel configuration
(bx6-sb9-a) #show port-channel all

            Port-                  Link
Log.       Channel            Adm. Trap  STP           Mbr      Port    Port
Intf        Name        Link  Mode Mode  Mode   Type   Ports    Speed   Active
------ --------------- ------ ---- ---- ------ ------- ------ --------- ------
1/1    Po1             Up     En.   En.  En.    Static  0/11   Auto      True
                                                        0/12   Auto      True
1/2    Po2             Up     En.   En.  En.    Static  0/13   Auto      True
                                                        0/14   Auto      True

! Check the VLAN configuration

(bx6-sb9-a) #show vlan


VLAN ID VLAN Name                        VLAN Type         Interface(s)
------- -------------------------------- ---------- -------------------------
1       Default                           Default    0/4,0/5,0/6,0/10,0/15,
                                                     0/16,1/1,1/2
10      VLAN-10                           Static     0/1,0/15,0/16,1/1,1/2
20      VLAN-20                           Static     0/2,0/15,0/16,1/1,1/2
(bx6-sb9-a) #
```

```
! Check if RSTP state at Cisco Switch A
!
Cisco-A#show spanning-tree

VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    1
             Address     0017.9470.3200
             This bridge is the root
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec

  Bridge ID  Priority    1  (priority 0 sys-id-ext 1)
             Address     0017.9470.3200
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec
             Aging Time 300

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- ------------------------------
```

```
Po1              Desg FWD 3         128.96   P2p
Po3              Desg FWD 3         128.112  P2p


VLAN0010
  Spanning tree enabled protocol rstp
  Root ID    Priority    10
             Address     0017.9470.3200
             This bridge is the root
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec

  Bridge ID  Priority    10  (priority 0 sys-id-ext 10)
             Address     0017.9470.3200
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec
             Aging Time 300

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Po1              Desg FWD 3         128.96   P2p
Po3              Desg FWD 3         128.112  P2p


VLAN0020
  Spanning tree enabled protocol rstp
  Root ID    Priority    20
             Address     0017.9470.3200
             This bridge is the root
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec

  Bridge ID  Priority    20  (priority 0 sys-id-ext 20)
             Address     0017.9470.3200
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec
             Aging Time 300

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Po1              Desg FWD 3         128.96   P2p
Po3              Desg FWD 3         128.112  P2p
```

```
! Check if RSTP state at Cisco Switch B
!
Cisco-B#show spanning-tree

VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    1
             Address     0017.9470.3200
             Cost        3
             Port        616 (Port-channel3)
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec

  Bridge ID  Priority    4097   (priority 4096 sys-id-ext 1)
             Address     000f.247b.d080
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec
             Aging Time 300

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Po2              Altn BLK 3         128.640  P2p
Po3              Root FWD 3         128.616  P2p


VLAN0010
  Spanning tree enabled protocol rstp
  Root ID    Priority    10
             Address     0017.9470.3200
             Cost        3
             Port        616 (Port-channel3)
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec

  Bridge ID  Priority    4106   (priority 4096 sys-id-ext 10)
             Address     000f.247b.d080
```

```
              Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec
              Aging Time 300

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Po2              Altn BLK 3         128.640  P2p
Po3              Root FWD 3         128.616  P2p


VLAN0020
  Spanning tree enabled protocol rstp
  Root ID    Priority    20
             Address     0017.9470.3200
             Cost        3
             Port        616 (Port-channel3)
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec

  Bridge ID  Priority    4116     (priority 4096 sys-id-ext 20)
             Address     000f.247b.d080
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec
             Aging Time 300

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Po2              Altn BLK 3         128.640  P2p
Po3              Root FWD 3         128.616  P2p
```

2.4.4 Configuration without VLAN Trunks

You set up the scenario shown in Figure 8 by performing the following steps:

- Step 1: Configure the switches
- Step 2: Verify the configuration

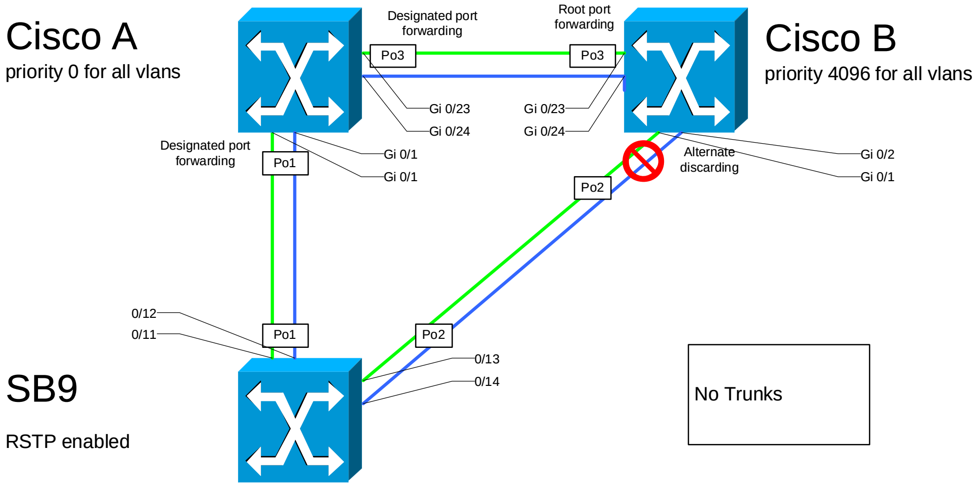


Figure 9 : Configuration example RSTP without VLAN trunks

Step 1: Configure the switches

```
! SB9 configuration
!
! Enable RSTP for the whole switch
spanning-tree
spanning-tree mode rstp

! Definine the port-channels
port-channel Po1
interface 1/1
exit
interface  0/11
channel-group 1/1
exit
interface  0/12
```

```
channel-group 1/1
exit
port-channel Po2
interface 1/2
exit
interface  0/13
channel-group 1/2
exit
interface  0/14
channel-group 1/2
exit

! Configure the interfaces
interface range 0/1 – 0/10
spanning-tree edgeport
spanning-tree port mode
interface range 0/11 – 0/14
spanning-tree port mode
exit

interface  1/1
staticcapability
spanning-tree port mode
exit

interface  1/2
staticcapability
spanning-tree port mode
exit
end
```

```
! Cisco Switch A

! Enable and configure RSTP
spanning-tree mode rapid-pvst
spanning-tree vlan 1 priority 0
!
! Timers are tuned. Please refer Cisco documentation before
! using this part of the configuration
!
spanning-tree vlan 1 hello-time 1
spanning-tree vlan 1 forward-time 8
spanning-tree vlan 1 max-age 11
!
! Define the port-channels
!
interface Port-channel1
 ! These commands are default and normally not displayed
 switchport mode access
 switchport access vlan 1
!
interface Port-channel3
 ! These commands are default and normally not displayed
 switchport mode access
 switchport access vlan 1
!
interface range GigabitEthernet0/1 - 2
 ! These commands are default and normally not displayed
 switchport mode access
 switchport access vlan 1
 channel-group 1 mode on
!
interface range GigabitEthernet0/23 - 24
 ! These commands are default and normally not displayed
 switchport mode access
 switchport access vlan 1
 channel-group 3 mode on
```

```
! Cisco Switch B
! Enable and configure RSTP
spanning-tree mode rapid-pvst
spanning-tree vlan 1 priority 0
!
! Timers are tuned. Please refer Cisco documentation before
! using this part of the configuration
!
spanning-tree vlan 1 hello-time 1
spanning-tree vlan 1 forward-time 8
spanning-tree vlan 1 max-age 11
!
! Define the port-channels
!
interface Port-channel2
 ! These commands are default and normally not displayed
 switchport mode access
 switchport access vlan 1
!
interface Port-channel3
 ! These commands are default and normally not displayed
 switchport mode access
 switchport access vlan 1
!
Interface range GigabitEthernet0/1 - 2
 ! These commands are default and normally not displayed
 switchport mode access
 switchport access vlan 1
 channel-group 2 mode on
!
interface range GigabitEthernet0/23 - 24
 ! These commands are default and normally not displayed
 switchport mode access
 switchport access vlan 1
 channel-group 3 mode on
```

Step 2: Verify the configuration

```
! Check if RSTP is enbled @ SB9
!
(bx6-sb9-a) #show spanning-tree summary

Spanning Tree Adminmode........... Enabled
Spanning Tree Version............. IEEE 802.1w
Configuration Name................ Default
Configuration Revision Level...... 0
Configuration Digest Key.......... 0xac36177f50283cd4b83821d8ab26de62
Configuration Format Selector..... 0
No MST instances to display.

! Check port-channel configuration
(bx6-sb9-a) #show port-channel all

            Port-                  Link
Log.       Channel             Adm. Trap  STP           Mbr      Port    Port
Intf        Name        Link  Mode Mode  Mode   Type   Ports    Speed   Active
------ -------------- ------ ---- ---- ------ ------- ------ --------- ------
1/1    Po1             Up     En.   En.  En.    Static  0/11   Auto      True
                                                        0/12   Auto      True
1/2    Po2             Up     En.   En.  En.    Static  0/13   Auto      True
                                                        0/14   Auto      True

! Check the RSTP State
(bx6-sb9-a) #show spanning-tree mst port summary 0 all

            STP                  STP            Port
Interface   Mode   Type          State           Role
--------- -------- ------- ----------------- ----------
0/1       Enabled          Forwarding       Designated
0/2       Enabled          Forwarding       Designated
0/3       Enabled          Disabled         Disabled
0/4       Enabled          Forwarding       Designated
```

```
0/5       Enabled          Disabled          Disabled
0/6       Enabled          Disabled          Disabled
0/7       Enabled          Disabled          Disabled
0/8       Enabled          Disabled          Disabled
0/9       Enabled          Disabled          Disabled
0/10      Enabled          Disabled          Disabled
0/11      Enabled  PC Mbr  Manual forwarding Disabled
0/12      Enabled  PC Mbr  Manual forwarding Disabled
0/13      Enabled  PC Mbr  Manual forwarding Disabled
0/14      Enabled  PC Mbr  Manual forwarding Disabled
0/15      Enabled          Disabled          Disabled


            STP                 STP            Port
Interface   Mode   Type         State            Role
--------- -------- ------- ----------------- ----------
0/16      Enabled          Disabled          Disabled
1/1       Enabled          Forwarding        Root
1/2       Enabled          Discarding        Alternate
```

```
! Check if RSTP state at Cisco Switch A
!
Cisco-A#show spanning-tree

VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    1
             Address     0017.9470.3200
             This bridge is the root
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec

  Bridge ID  Priority    1  (priority 0 sys-id-ext 1)
             Address     0017.9470.3200
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec
             Aging Time 300

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Po1              Desg FWD 3         128.96   P2p
Po3              Desg FWD 3         128.112  P2p
```

```
! Check if RSTP state at Cisco Switch B
!
Cisco-B#show spanning-tree

VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    1
             Address     0017.9470.3200
             Cost        3
             Port        616 (Port-channel3)
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec

  Bridge ID  Priority    4097   (priority 4096 sys-id-ext 1)
             Address     000f.247b.d080
             Hello Time   1 sec  Max Age 11 sec  Forward Delay  8 sec
             Aging Time 300

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Po2              Altn BLK 3         128.640  P2p
Po3              Root FWD 3         128.616  P2p
```

2.5 Access Port and NIC Configuration

2.5.1 Introduction

In a typical setup, ports for server access are not configured as VLAN trunks but as normal access ports. Since the SB9 configuration differs slightly from the Cisco configuration, we show how to set up an access port of the SB9.

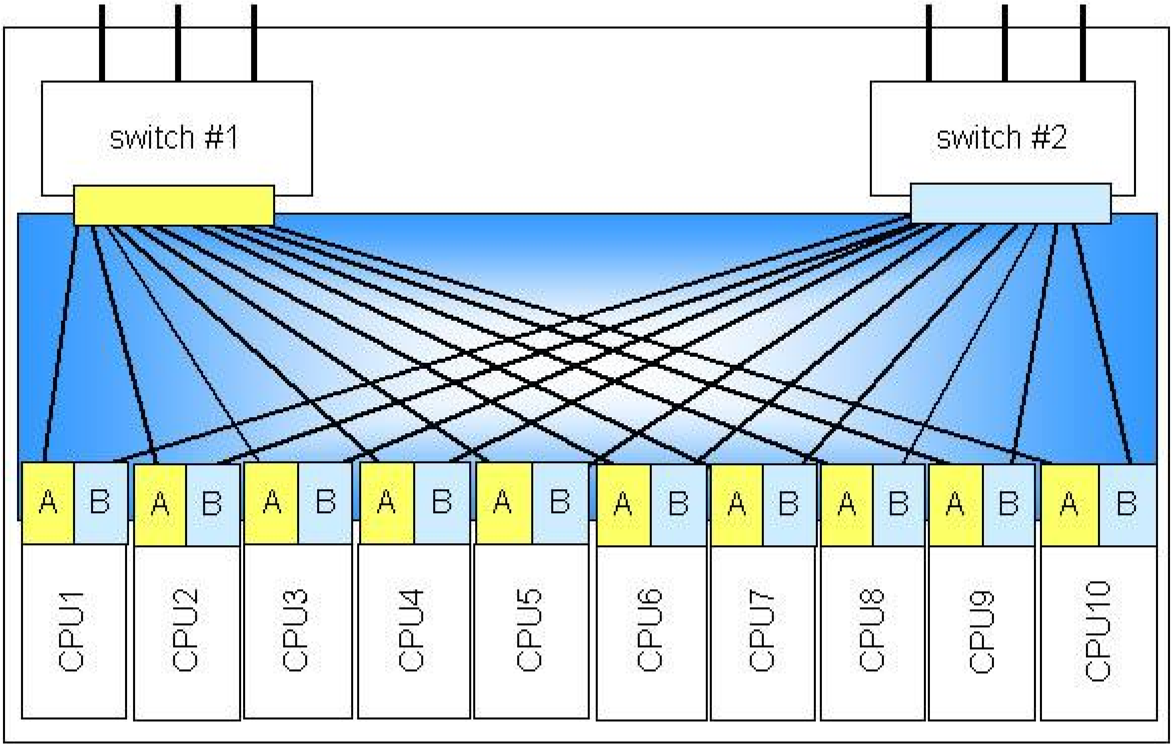


Figure 10 : BX600 port mapping

To ensure high availability of the servers, most BX600 racks will be equipped with two SB9 switches. In this case each blade has one NIC port connected to the first SB9 and another port connected to the second SB9 switch (see also Figure 10). In order to provide a fast failover between these NIC ports, both switch ports must be configured identically and the NIC failover must be configured in the right way.

2.5.2 Recommended solution

The failover mechanism depends on the NIC vendor. At the moment there are two different type of NICs used for CPU blades: Intel and Broadcom.

For CPUs equipped with Broadcom NICs running Microsoft Windows there are in general two failover mechanisms available:

- Smart Load Balance and Failover (with and without Auto-Fallback)
- Link Aggregation (802.3ad or FEC/GEC)

Since the two ports of the NIC are terminated on two different switches, link aggregation cannot be used for failover. SLB depends on the link state of the NIC. When the CPU comes up, the primary adapter will become active. If the corresponding switch fails and the link state goes down, the secondary adapter takes over. If the link state of the primary adapter comes back and “Auto-Fallback” is enabled, the primary adapter will become active again.
Since the link state of the primary adapter may come up before the uplinks of the corresponding switches are forwarding, this may lead to an unnecessary network failure. We recommend using SLB without Auto-Fallback for CPU with Broadcom NICs running Microsoft Windows.

Almost the same applies to CPUs equipped with Intel NICs running under Microsoft Windows. They provide some additional failover mechanisms:

- Adapter Fault Tolerance (AFT)
- Adaptive Load Balancing (ALB)
- Link Aggregation (Static or 802.3ad)
- Switch Fault Tolerance (SFT)

Link aggregation cannot also be used with Intel adapters in a BX600 rack. AFT and ALB both define a primary adapter and will fallback automatically when the link comes back after a switch failure. This would lead to the same problem as Auto-Fallback on Broadcom NICs.
If you configure SFT with no adapter priorities there will be no automatic fallback. This is the recommended setup for CPU Blades equipped with Intel NICs running Microsoft Windows.

Failover times of under one second can be achieved by following our recommendations.

2.5.3 Configuration

The following sample configurations show how to set up the switches' access ports and the NIC drivers in a typical setup as shown in Figure 11.

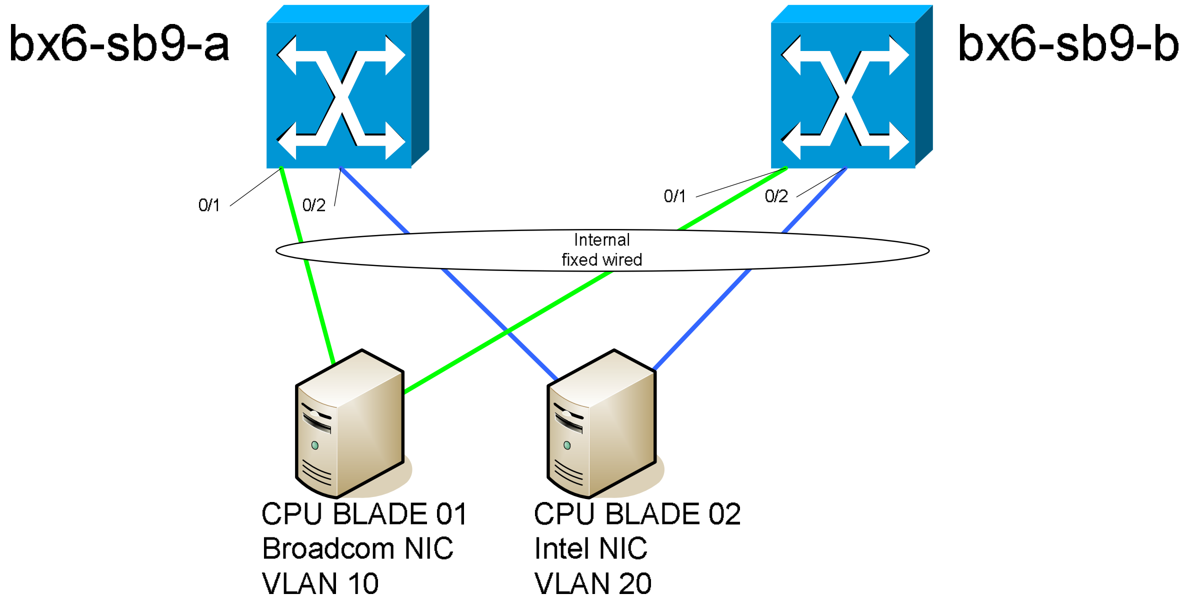


Figure 11 : Typical access port configuration

The following steps are required to configure this scenario:

- Step 1: Configure the access ports of the switches
- Step 2: Configure the Broadcom Adapter
- Step 3: Configure the Inter Adapter

Step 1: Configure the access ports of the switches

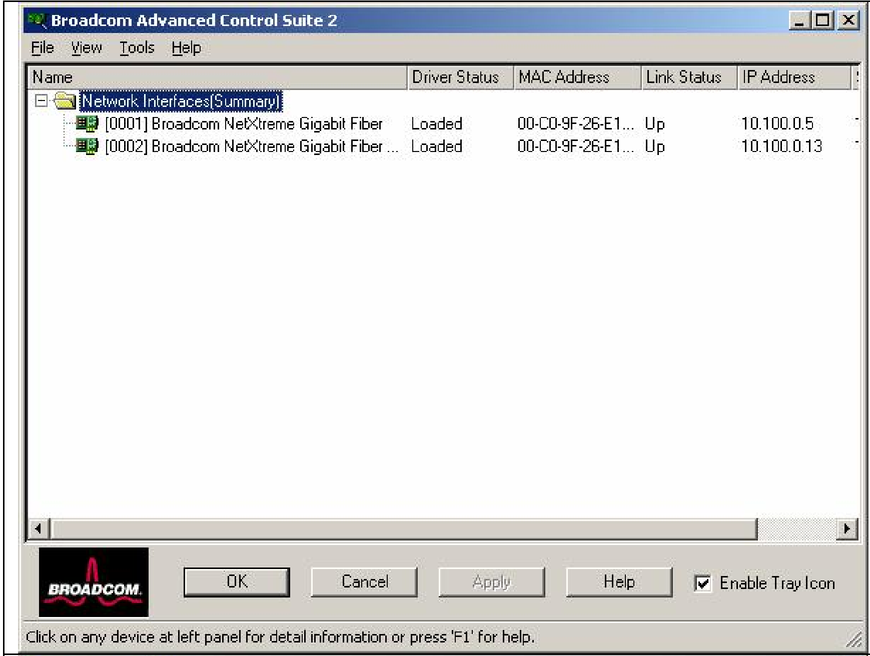
```
! Configuration of bx6-sb9-a
interface  0/1
! This line is only needed if you are running STP on the switch
spanning-tree edgeport
! Forbid all VLANs but the access VLAN
switchport forbidden vlan add 1
switchport forbidden vlan add 20
! Permit the access VLAN
switchport allowed vlan add 10
! Set the access VLAN as native VLAN
switchport native vlan 10
exit

interface  0/2
! This line is only needed if you are running STP on the switch
spanning-tree edgeport
! Forbid all VLANs but the access VLAN
switchport forbidden vlan add 1
switchport forbidden vlan add 10
! Permit the access VLAN
switchport allowed vlan add 20
! Set the access VLAN as native VLAN
switchport native vlan 20
exit
```

```
! Configuration of bx6-sb9-b
interface  0/1
! This line is only needed if you are running STP on the switch
spanning-tree edgeport
! Forbid all VLANs but the access VLAN
switchport forbidden vlan add 1
switchport forbidden vlan add 20
! Permit the access VLAN
```

```
switchport allowed vlan add 10
! Set the access VLAN as native VLAN
switchport native vlan 10
exit

! This line is only needed if you are running STP on the switch
spanning-tree edgeport
! Forbid all VLANs but the access VLAN
switchport forbidden vlan add 1
switchport forbidden vlan add 10
! Permit the access VLAN
switchport allowed vlan add 20
! Set the access VLAN as native VLAN
switchport native vlan 20
exit
```

Step 2: Configure the Broadcom NIC

To configure the Broadcom NIC, start the “Broadcom Advanced Control Suite 2”.

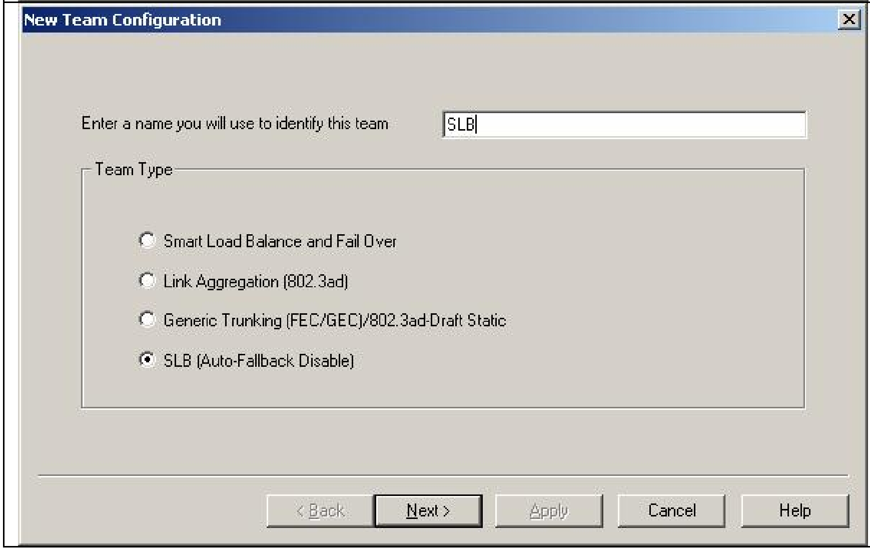


Name	Driver Status	MAC Address	Link Status	IP Address
Network Interfaces(Summary)				
[0001] Broadcom NetXtreme Gigabit Fiber	Loaded	00-C0-9F-26-E1...	Up	10.100.0.5
[0002] Broadcom NetXtreme Gigabit Fiber ...	Loaded	00-C0-9F-26-E1...	Up	10.100.0.13

☑ Enable Tray Icon

Click on any device at left panel for detail information or press 'F1' for help.

This is the main window of the “Broadcom Advanced Control Suite 2”.
Select the menu item “Tools->Create a Team”



Enter a name you will use to identify this team: SLB

Team Type

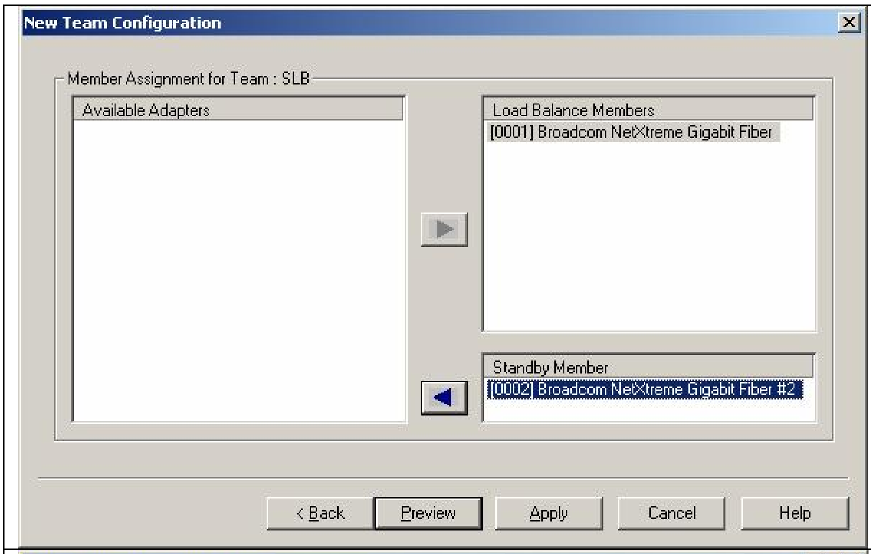
○ Smart Load Balance and Fail Over

○ Link Aggregation (802.3ad)

○ Generic Trunking (FEC/GEC)/802.3ad-Draft Static

● SLB (Auto-Fallback Disable)

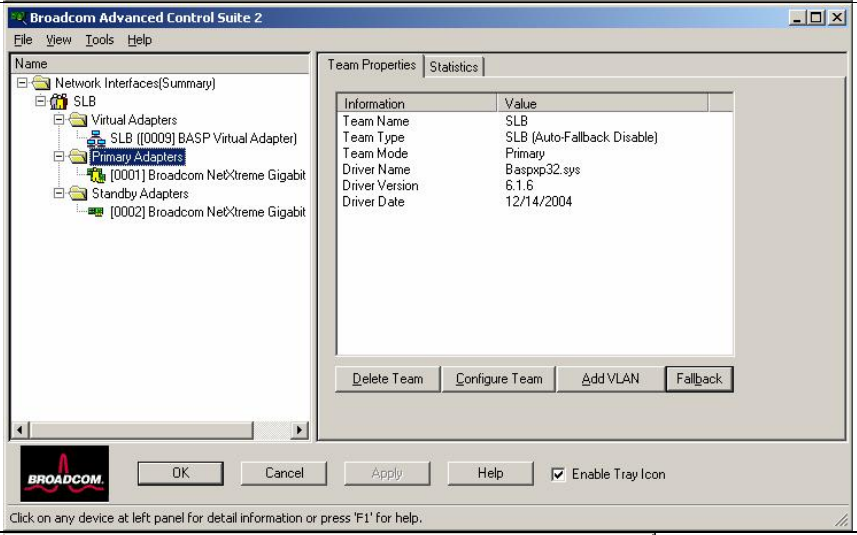
Enter a name for the team and press “Next>”



Load Balance Members: [0001] Broadcom NetXtreme Gigabit Fiber

Standby Member: [0002] Broadcom NetXtreme Gigabit Fiber #2

Select the first adapter as "Load Balance Member" and the second as "Standby Member" and press "Preview".

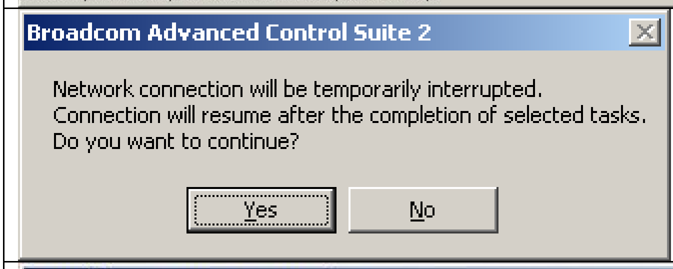


Information	Value
Team Name	SLB
Team Type	SLB (Auto-Fallback Disable)
Team Mode	Primary
Driver Name	Baspxp32.sys
Driver Version	6.1.6
Driver Date	12/14/2004

☑ Enable Tray Icon

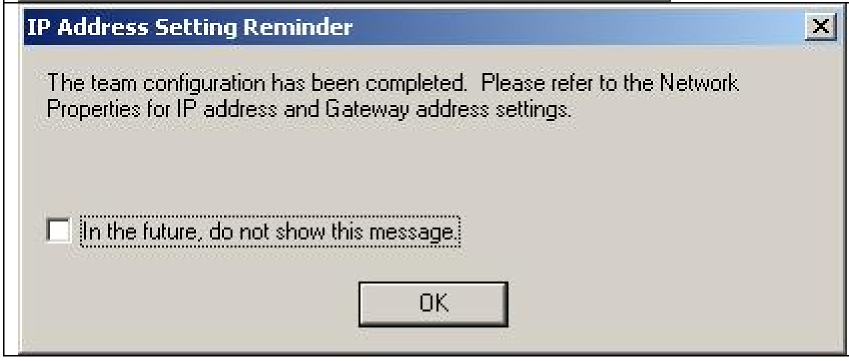
Click on any device at left panel for detail information or press 'F1' for help.

Review the configuration and press "OK"



Network connection will be temporarily interrupted.
Connection will resume after the completion of selected tasks.
Do you want to continue?

Press "Yes"



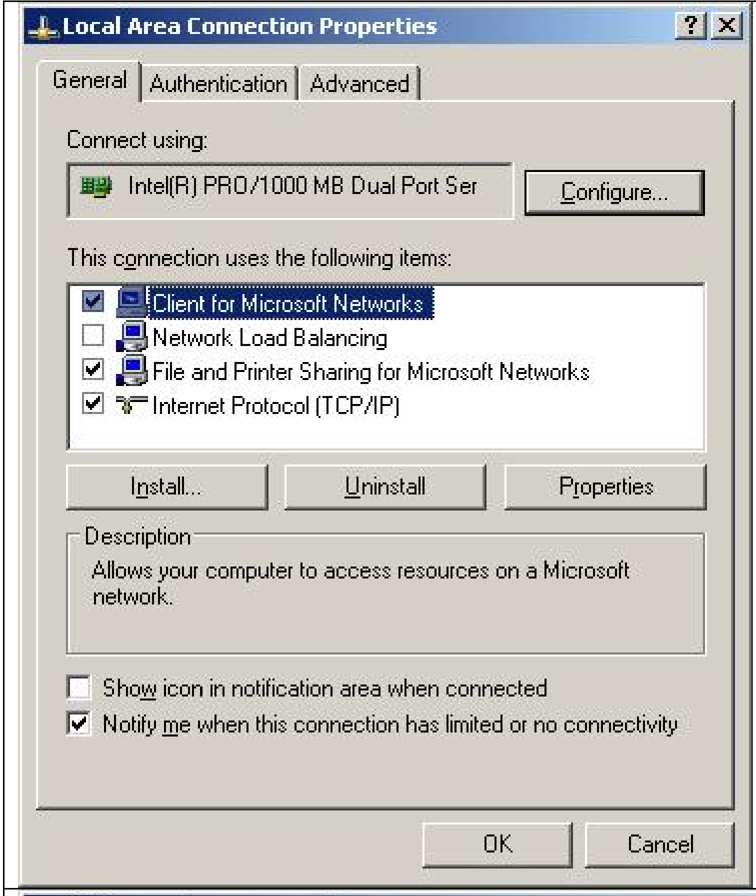
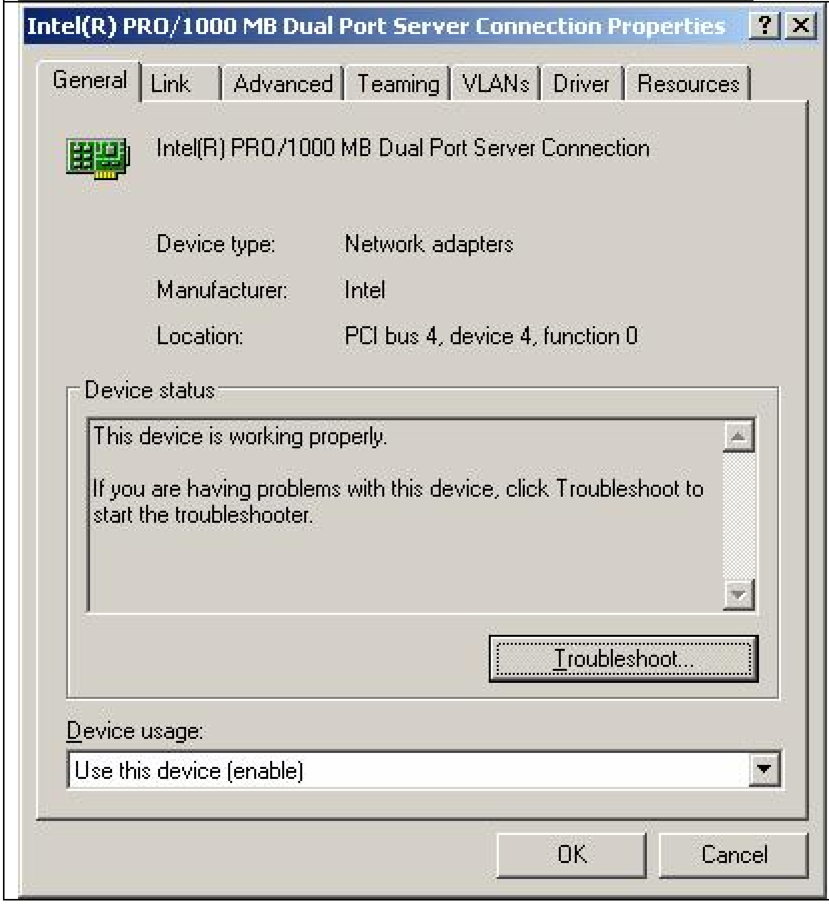
The team configuration has been completed. Please refer to the Network Properties for IP address and Gateway address settings.

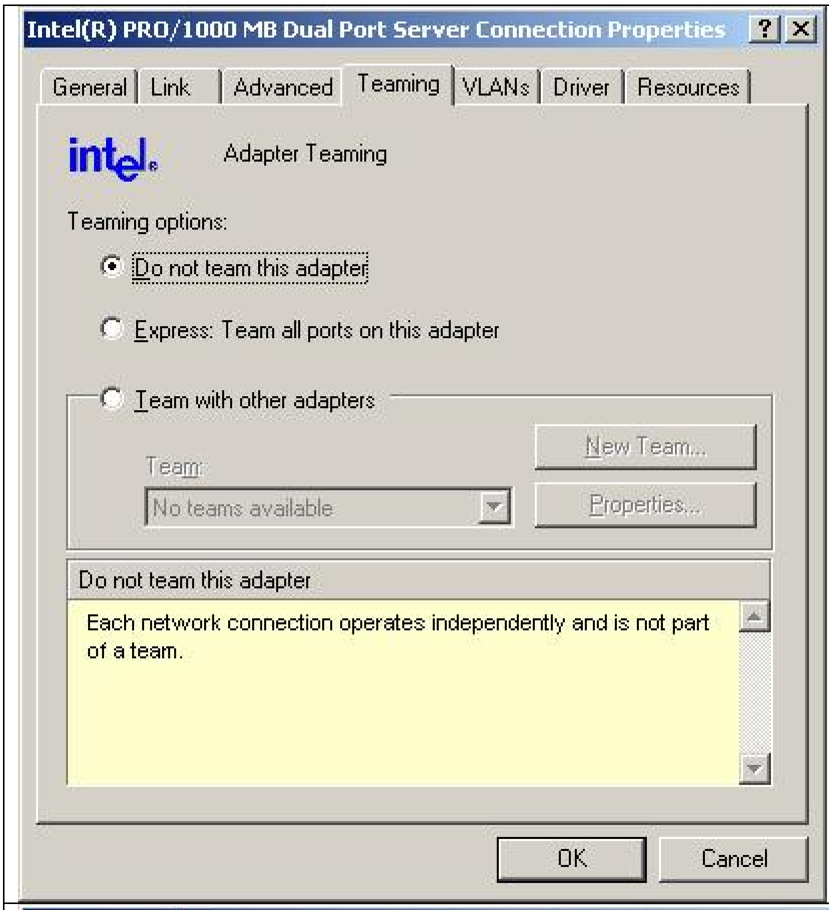
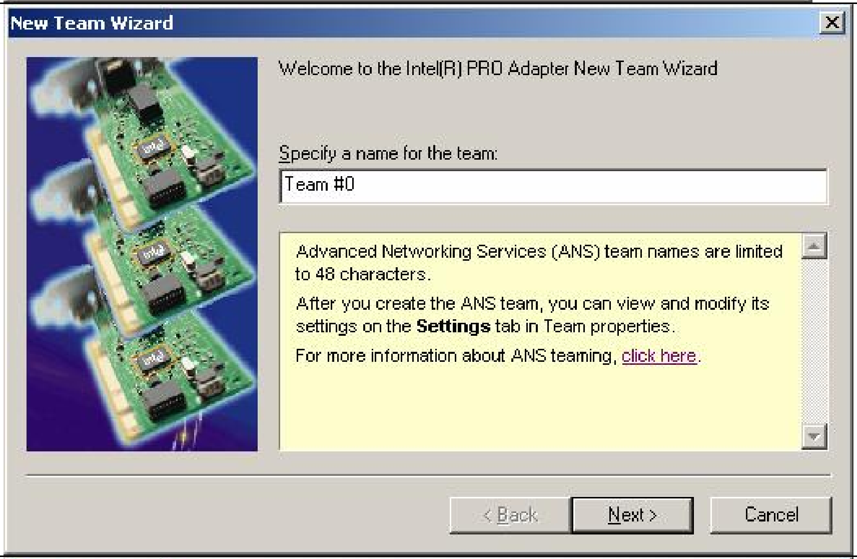
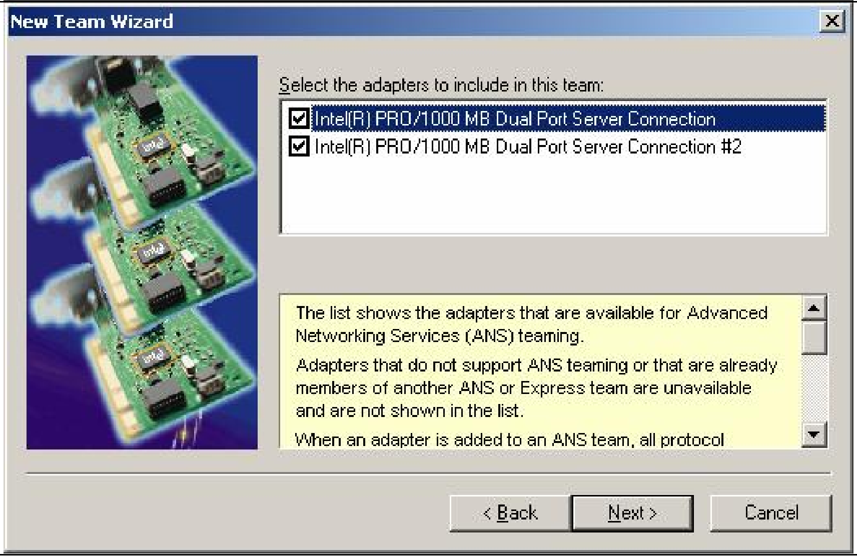
□ In the future, do not show this message.

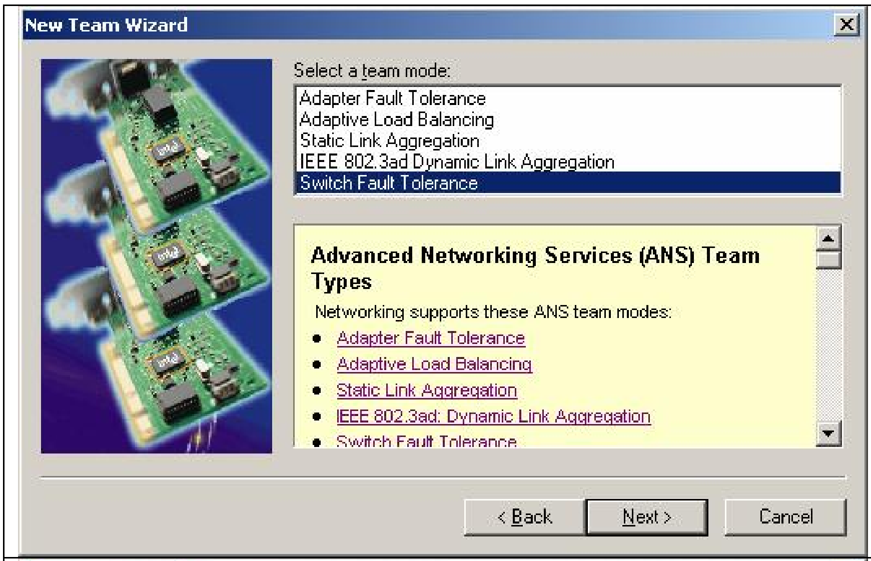
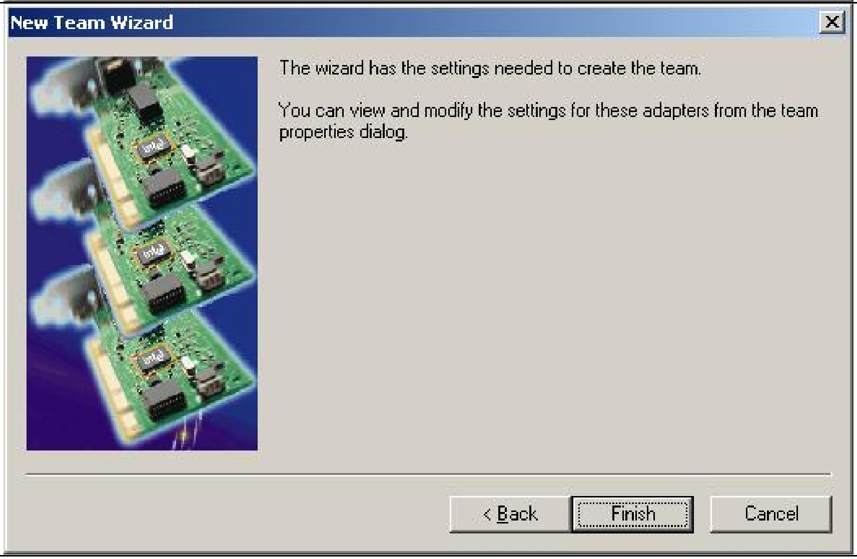
Press "OK"

Step 3: Configure the Intel Adapter

To configure the Intel NIC, open the “Local Area Connection Properties” for the first adapter.

 Local Area Connection Properties General | Authentication | Advanced Connect using: Intel(R) PRO/1000 MB Dual Port Ser Configure... This connection uses the following items: ☑ Client for Microsoft Networks ☐ Network Load Balancing ☑ File and Printer Sharing for Microsoft Networks ☑ Internet Protocol (TCP/IP) Install... | Uninstall | Properties Description Allows your computer to access resources on a Microsoft network. ☐ Show icon in notification area when connected ☑ Notify me when this connection has limited or no connectivity OK | Cancel	Press ”Configure”
 Intel(R) PRO/1000 MB Dual Port Server Connection Properties General | Link | Advanced | Teaming | VLANs | Driver | Resources Intel(R) PRO/1000 MB Dual Port Server Connection Device type: Network adapters Manufacturer: Intel Location: PCI bus 4, device 4, function 0 Device status This device is working properly. If you are having problems with this device, click Troubleshoot to start the troubleshooter. Troubleshoot... Device usage: Use this device (enable) OK | Cancel	Select the “Teaming” tab

 Intel(R) PRO/1000 MB Dual Port Server Connection Properties General | Link | Advanced | Teaming | VLANs | Driver | Resources Adapter Teaming Teaming options: ● Do not team this adapter ○ Express: Team all ports on this adapter ○ Team with other adapters Team: No teams available New Team... Properties... Do not team this adapter Each network connection operates independently and is not part of a team. OK Cancel	Select "Team with other adapters" and Press "New Team"
 New Team Wizard Welcome to the Intel(R) PRO Adapter New Team Wizard Specify a name for the team: Team #0 Advanced Networking Services (ANS) team names are limited to 48 characters. After you create the ANS team, you can view and modify its settings on the **Settings** tab in Team properties. For more information about ANS teaming, click here. < Back Next > Cancel	Enter a name for the team and press "Next"
 New Team Wizard Select the adapters to include in this team: ☑ Intel(R) PRO/1000 MB Dual Port Server Connection ☑ Intel(R) PRO/1000 MB Dual Port Server Connection #2 The list shows the adapters that are available for Advanced Networking Services (ANS) teaming. Adapters that do not support ANS teaming or that are already members of another ANS or Express team are unavailable and are not shown in the list. When an adapter is added to an ANS team, all protocol < Back Next > Cancel	Check the desired adapters and press "Next"

 New Team Wizard Select a team mode: Adapter Fault Tolerance Adaptive Load Balancing Static Link Aggregation IEEE 802.3ad Dynamic Link Aggregation Switch Fault Tolerance **Advanced Networking Services (ANS) Team Types** Networking supports these ANS team modes: ● Adapter Fault Tolerance ● Adaptive Load Balancing ● Static Link Aggregation ● IEEE 802.3ad: Dynamic Link Aggregation ● Switch Fault Tolerance < Back Next > Cancel	Select "Switch Fault Tolerance" and press “Next”
 New Team Wizard The wizard has the settings needed to create the team. You can view and modify the settings for these adapters from the team properties dialog. < Back Finish Cancel	Press "Finish"

2.6 Link State

2.6.1 Introduction

BX600 Blade Servers are equipped with 2 independent LAN ports by default. LAN Port redundancy is realized by utilizing NIC management programs with LAN teaming functions such as ‘Broadcom BACS’, ‘Intel ProSETII’ and ‘Linux Channel Bonding’. However the server blade cannot detect a link down situation or a port failure situation timely if link failures occur on the uplink port(s) on SB9 Switch connected to the next higher level switches. In this case, it takes a long time (over 5-10 seconds) to perform a NIC failover via the teaming software of the server blade (it depends on polling period implemented in NIC management program). In order to realize a “rapid” fail-over of redundant blade server LAN ports, SB9 is able to shut down ports linked to server blades (internal ports) whenever an uplink port (external port) fails. If the upstream port is resumed to active state, the downstream ports will be enabled again.

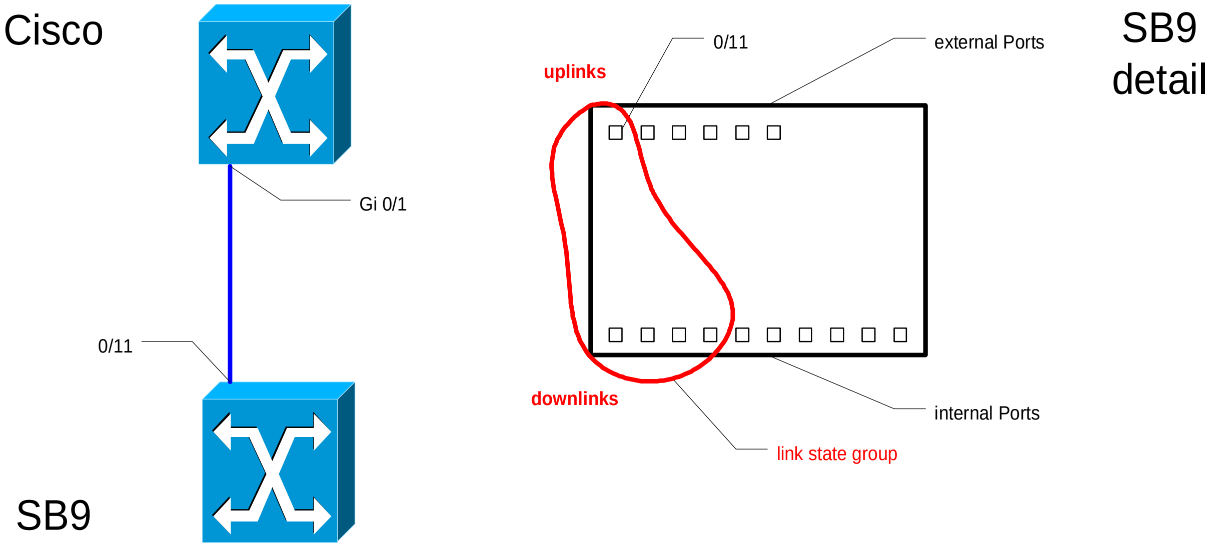


Figure 12 : Link State Group

2.6.2 Recommended Solution

The SB9 provides a monitor task to see the link level of the upstream ports. If any upstream port fails, SB9 will disable the downstream ports belonging to the same Link State Group. This enables the LAN Teaming Software to detect the link failure and to switch the LAN port from failed one (Link down) to a working one in a short time. We recommend configuring link state groups for the considered ports in the customer configuration to improve failover behaviour

2.6.3 Configuration

The following steps are necessary to set up a Link State Group:

- 1. Enable the Link State feature and create a Link State Group
- 2. Configure the up- and downstream ports and enable the configured Link State Group
- 3. Verify the configuration

Step 1: Configure a Link State Group

```
link state
! Enables the Link State admin mode
link state group
! Creates a link state group
```

Step 2: Configure the up- and downstream ports and enable the configured Link State Group

```
interface range 0/1 – 0/4
link state group 1 downstream
! Sets the downstream port(s) for a Link State Group (Port 1 to 4 in this example)
exit

interface 0/11
link state group 1 upstream
! Sets the monitored upstream port for a Link State Group
exit

link state group enable 1
! Enables the configured Link State Group
```

Step 3: Verify the configuration

```
show link state
! Shows information about configured Link State Groups
```

3 Basic Multicast Services

3.1 Introduction

IP Multicast applications are common to many datacenter networks. At least the deployment software for the blade server often uses multicast to deploy multiple servers using one data stream. In most Cisco networks, the SB9 will act as a Layer 2 switch which has to perform IGMP snooping in order to avoid unnecessary multicast traffic at ports that are not interested in this traffic.

3.2 Recommended solution

It is advisable to enable IGMP snooping over the whole broadcast domain and therefore at all switches. To get IGMP snooping running you will need one IGMP querier per VLAN. In most cases there will be a Layer 3 switch in each VLAN which is also the unicast router for that VLAN.

We recommended you to configure this router for multicast routing and enable a IGMP querier in this way, because the multicast router will need the IGMP information anyway. At the SB9 and at all other L2 switches, you only need to enable IGMP snooping.

3.3 Configuration

The following steps are necessary to set up IGMP snooping:

- 1. Enable multicast routing and IGMP at the layer 3 switch
- 2. Enable IGMP snooping at all layer 2 switches
- 3. Verify the configuration

1. Enable multicast routing and IGMP at the layer 3 switch

```
! Layer 3 Switch Configuration
! ============================
!
! In this example PIM dense mode is activated since this is the
! most simple solution. In datacenter networks a more sophisticated solution
! should be used but multicast routing is not in the scope of this document.
!
ip multicast-routing distributed
!
interface Vlan1
 ip address 10.222.0.1 255.0.0.0
 ip pim dense-mode
!
interface Vlan10
 ip address 192.168.10.1 255.255.255.0
 ip pim dense-mode
!
interface Vlan20
 ip address 192.168.20.1 255.255.255.0
 ip pim dense-mode
```

2. Enable IGMP snooping at all Layer 2 switches

```
! Layer 2 Switch Configuration (Cisco)
!
! All these commands are enable by default and are not seen in the config normally
!
! Enable IGMP snooping global
ip igmp snooping

! Enable IGMP snooping for VLANs
ip igmp snooping vlan 1
ip igmp snooping vlan 10
ip igmp snooping vlan 20
```

```
! SB9 Switch Configuration
!
! Enable IGMP snooping global
```

```
ip igmp snooping

! Enable IGMP snooping for VLANs
vlan database
set igmp 1
set igmp 10
set igmp 20
exit

! Enable IGMP snooping for ports
interface  0/1 - 0/16
ip igmp snooping interfacemode
exit

interface  1/1 - 1/2
ip igmp snooping interfacemode
exit
```

3. Verify the configuration

```
(bx6-sb9-b) #show ip igmp snooping

Admin Mode..................................... Enable
Multicast Control Frame Count.................. 89107
Interfaces Enabled for IGMP Snooping........... 0/1
                                                0/2
                                                0/3
                                                0/4
                                                0/5
                                                0/6
                                                0/7
                                                0/8
                                                0/9
                                                0/10
                                                0/11
                                                0/12
                                                0/13
                                                0/14
                                                0/15
                                                0/16
                                                1/1
                                                1/2
Vlans enabled for IGMP snooping................ 1
                                                10
                                                20

=================================================================

(bx6-sb9-b) #show ip igmp snooping  mrouter


  VLAN    Type                             Memeber Port
 ====== =========  =========================================================
   1     Dynamic   1/1
  10     Dynamic   1/1
  20     Dynamic   1/1

=================================================================
(bx6-sb9-b) #show ip igmp snooping  multicast


  VLAN         MAC Addr      Type                        Memeber Port
 ===== =================== ========= =========================================
   1    01:00:5e:00:01:18   Dynamic  1/1
   1    01:00:5e:00:01:28   Dynamic  1/1
   1    01:00:5e:00:01:3c   Dynamic  1/1
   1    01:00:5e:00:17:17   Dynamic  1/1
   1    01:00:5e:7f:00:01   Dynamic  1/1,0/5 <====== 0/5 has joined 239.255.0.1
   1    01:00:5e:7f:00:02   Dynamic  1/1,0/5 <====== 0/5 has joined 239.255.0.2
   1    01:00:5e:7f:ff:fa   Dynamic  1/1
   1    01:00:5e:7f:ff:fe   Dynamic  1/1
  10    01:00:5e:7f:00:01   Dynamic  1/1,0/1
  10    01:00:5e:7f:00:02   Dynamic  1/1,0/1
  20    01:00:5e:7f:00:01   Dynamic  1/1,0/2
  20    01:00:5e:7f:00:02   Dynamic  1/1,0/2
```

4 Switch Management

4.1 Logging and Synchronization

4.1.1 Introduction

When there are problems in a network it is vital to log the events at all network devices. Since a data center network often consists of many network devices, a central logging server is used to collect the information from all components.
Logging information is usually sent using the protocol syslog (RFC 3164), which is supported both by SB9 and Cisco switches. The server may be an UNIX system, in which a syslog daemon is usually distributed with the operating system, or a Windows system with a special syslog server installed.
A syslog message includes a time stamp to enable administrators to correlate events, and it is therefore necessary to synchronize the time bases used by all the devices.
The standards for this task are NTP and SNTP. NTP (Network Time Protocol) is a mechanism that ensures reliable synchronization between devices over IP networks, even where there is a high delay on the lines, such as when the synchronization is running over WAN links. When running in a LAN environment you can use a less complex protocol (SNTP, standing for simple NTP), which is compatible to NTP and can use a NTP server as time source.

4.1.2 Recommended Solution

Since syslog is an unreliable protocol, we recommend that you also enable logging to memory at the SB9. The synchronization should be performed by configuring two NTP servers or using a NTP broadcast source, as specified in whichever standard is in use at the data center.

4.1.3 Configuration of syslog and SNTP

The following steps are necessary to enable logging and SNTP

- Step 1a: Configure the SB9 for unicast SNTP
- Step 1b: Alternatively configure the SB9 for broadcast SNTP
- Step 2: Configure the SB9 for logging and syslog
- Step 3: Test the configuration

Step 1a: Configure the SB9 for unicast SNTP

```
! SB9 unicast SNTP configuration
!
! Enable the SNTP client
sntp client mode unicast
!
! Configure the NTP server
sntp server 10.222.0.1 ipv4
sntp server 10.222.0.2 ipv4
! Configure the time zone
sntp clock timezone MEST 2 0 before-utc
```

Step 1b: Configure the SB9 for broadcast SNTP

```
! SB9 broadcast SNTP configuration
!
! Enable the SNTP client in broadcast mode
sntp client mode broadcast
!
! Configure the time zone
sntp clock timezone MEST 2 0 before-utc
```

Step 2: Configure the SB9 for logging and syslog

```
! SB9 logging configuration
!
! Enable logging into memory
logging buffered
!
! Wrap the logging buffer when capacity is reached
logging buffered wrapped
!
! Enable syslog
logging syslog
!
! Send syslog messages to 10.222.0.21 port 514 (default)
! Include all messages upto debug severity
logging host 10.222.0.21 514 debug
!
```

Step 3: Test the configuration
When running in SNTP unicast mode, the output is as follows:

```
(bx6-sb9-a) #show sntp

Last Update Time:                  AUG 21 13:34:59 2006
Last Unicast Attempt Time:         AUG 21 13:34:59 2006
Last Attempt Status:               Success

Broadcast Count:                   0

Time Zone          : MEST 02:00 Before UTC


(bx6-sb9-a) #show sntp client

Client Supported Modes:              unicast broadcast
SNTP Version:                        4
Port:                                123
Client Mode:                         unicast
Unicast Poll Interval:               6 , which mean 2^6 in seconds
Poll Timeout (seconds):              5
Poll Retry:                          1

(bx6-sb9-a) #show calendar

Current Time : 8/21/2006 13:36:20
```

When running in STNP broadcast mode, the output is as follows:

```
(bx6-sb9-a) #show sntp client

Client Supported Modes:              unicast broadcast
SNTP Version:                        4
Port:                                123
Client Mode:                         broadcast
Broadcast Poll Interval:             6 , which mean 2^6 in seconds

(bx6-sb9-a) #show sntp

Last Update Time:                  AUG 21 13:55:16 2006
Last Unicast Attempt Time:         AUG 21 13:40:22 2006
Last Attempt Status:               Success

Broadcast Count:                   2

Time Zone          : MEST 02:00 Before UTC

(bx6-sb9-a) #show calendar

Current Time : 8/21/2006 13:56:27
```

At the syslog server, entries may look like as follows:

```
17.08.2006 13:29    Kernel.Info      10.0.2.70AUG 17 13:27:56 10.0.2.70-1 UNKN[199044152]:
sntp_client.c(1679) 36 %% SNTP: system clock synchronized on THU AUG 17 13:27:56 2006 UTC
17.08.2006 13:31    Kernel.Notice10.0.2.70    AUG 17 13:30:11 10.0.2.70-1 TRAPMGR[248845768]:
traputil.c(703) 37 %% Link Up: Unit: 1 Slot: 0 Port: 11
17.08.2006 13:31    Kernel.Notice10.0.2.70    AUG 17 13:30:11 10.0.2.70-1 TRAPMGR[248845768]:
traputil.c(703) 38 %% Link Up: Unit: 1 Slot: 0 Port: 12
17.08.2006 13:31    Kernel.Notice10.0.2.70    AUG 17 13:30:11 10.0.2.70-1 TRAPMGR[248845768]:
traputil.c(703) 39 %% Link Up: Unit: 1 Slot: 1 Port: 1
17.08.2006 14:02    Kernel.Notice10.0.2.70    AUG 17 14:01:23 10.0.2.70-1 TRAPMGR[248845768]:
traputil.c(703) 48 %% Link Up: Unit: 1 Slot: 1 Port: 2
17.08.2006 14:02    Kernel.Notice10.0.2.70    AUG 17 14:01:54 10.0.2.70-1 TRAPMGR[248845768]:
traputil.c(703) 49 %% Link Down: Unit: 1 Slot: 0 Port: 14
```

4.2 SNMP

4.2.1 Introduction

In most enterprise networks, SNMP is used for monitoring of network components. The most common protocol versions are SNMPv1 and SNMPv2c, which are fully supported by the SB9. SNMPv3 is seldom used today.

4.2.2 Recommended Solution

We recommend you to enable SNMPv1 and SNMPv2c at the SB9 and (for security reasons) to enable authentication for SNMPv3.

4.2.3 Configuration of SNMP

The following steps are necessary in order to configure SNMP

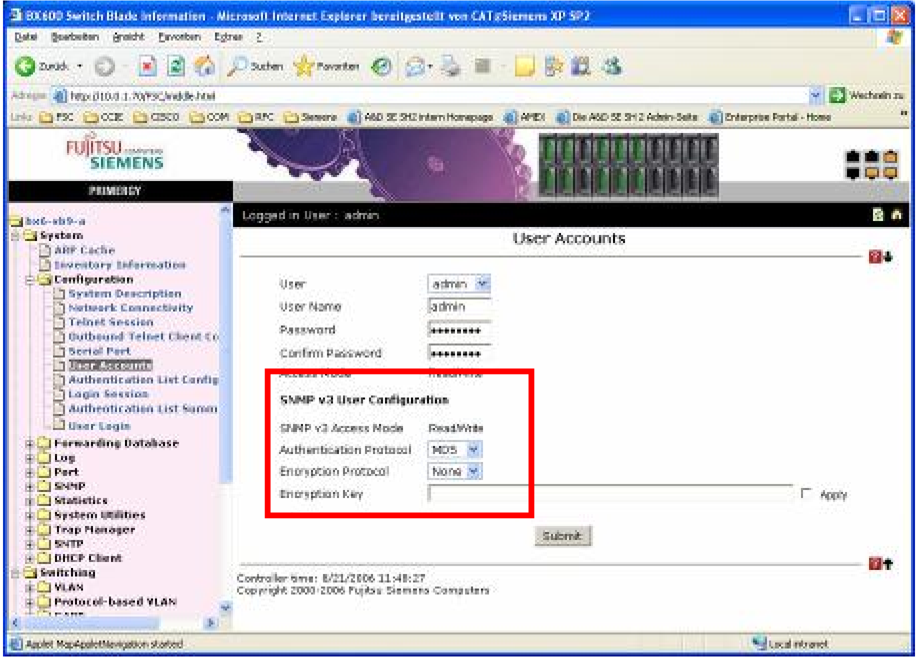
- Step 1: Configure SNMP for SNMPv1 and SNMPv2c
- Step 2: Configure SNMPv3 authentication
- Step 3: Test the SNMP configuration using your favorite SNMP management tool

Step 1: Configure SNMP for SNMPv1 and SNMPv2c

```
! SNMP v1 and v2c setup for SB9

! Configure the description, system name, contact and the location
!
!System Description "FSC SwitchBlade"
snmp-server sysname "bx6-sb9-a"
snmp-server location "Team PCT"
snmp-server contact "Test123"

! configure two snmp community strings (e.g. read and write)
!
snmp-server community ro read
snmp-server community rw write

! remove the default community strings
no snmp-server community public
no snmp-server community private

! configure the trap receiver
!
! … for SNMPv2c
snmptrap MySNMPv2 10.222.0.20
! … for SNMPv1
snmptrap MySNMPv1 10.222.0.20 snmpversion snmpv1
```

Step 2: Configure SNMPv3 authentication

It is important to set the SNMPv3 authentication protocol to “MD5” for each configured user name, to ensure that nobody can access the switch using SNMPv3 without authentication. This can only be done using the web interface.



Logged in User : admin

User Accounts

User: admin

User Name: admin

Password: ********

Confirm Password: ********

Access Mode: Read/Write

SNMP v3 User Configuration

SNMP v3 Access Mode: Read/Write

Authentication Protocol: MD5

Encryption Protocol: None

Encryption Key: □ Apply

Controller time: 8/21/2006 11:48:27

Copyright 2000-2006 Fujitsu Siemens Computers

Step 3: Test the SNMP configuration using your favorite SNMP management tool

The following tests have been done using NET-SNMP with SNMPv2:

```
C:\>snmpwalk -v 2c -c read 10.0.1.70 system
SNMPv2-MIB::sysDescr.0 = STRING: FSC SwitchBlade
SNMPv2-MIB::sysObjectID.0 = OID: SNMPv2-SMI::enterprises.231
DISMAN-EVENT-MIB::sysUpTimeInstance = Timeticks: (26581200) 3 days, 1:50:12.00
SNMPv2-MIB::sysContact.0 = STRING: Test123
SNMPv2-MIB::sysName.0 = STRING: bx6-sb9-a
SNMPv2-MIB::sysLocation.0 = STRING: Team PCT
SNMPv2-MIB::sysServices.0 = INTEGER: 6
SNMPv2-MIB::sysORLastChange.0 = Timeticks: (500) 0:00:05.00

C:\>snmpget -v 2c -c write 10.0.1.70 sysContact.0
SNMPv2-MIB::sysContact.0 = STRING: Test123

C:\>snmpset -v 2c -c write 10.0.1.70 sysContact.0 s "SNMP v2c Write Test"
SNMPv2-MIB::sysContact.0 = STRING: SNMP v2c Write Test

C:\>snmpget -v 2c -c write 10.0.1.70 sysContact.0
SNMPv2-MIB::sysContact.0 = STRING: SNMP v2c Write Test

C:\>snmpset -v 2c -c read 10.0.1.70 sysContact.0 s "SNMP v2c Read-Only Test"
Error in packet.
Reason: noAccess
Failed object: SNMPv2-MIB::sysContact.0
```

4.3 Remote Console Access

4.3.1 Introduction

In addition to the web interface, the SB9 supports three methods of accessing the command line interface:

- Console access using console redirection of the management blade
- Telnet access
- SSH access

During the initial setup, console redirection is the only possible way of accessing the switch. Access using telnet or SSH will subsequently be more convenient.

4.3.2 Recommended Solution

Telnet is an unencrypted protocol, which means that not only the data but also the password is sent unencrypted over IP. For this reason most enterprise customers prefer not to use telnet. SSH encrypts not only the password but also the entire data traffic, and is the preferred protocol for remote console access.

We recommend you to enable SSH and disable telnet access to the switch.

4.3.3 Configuration of SSH

The following steps are necessary to enable SSH and disable telnet.

- Step 1: Configure the SB9
- Step 2: Test the login

Step 1: Configure the SB9

```
! SB9 ssh configuration
!
! Enable ssh
ip ssh
! Set the procol version 2
ip ssh protocol 2

! Disable telnet
line vty
no sessions
exit
```

Step 2: Test the login

One of the popular SSH clients is “putty” which is distributed under license from MIT.

```
C:\> putty bx6-sb9-b

login as: test-ro
test-ro @bx6-sb9-b's password:

(bx6-sb9-b) >
```

4.4 Integration into Radius and TACACS+

4.4.1 Introduction

Radius and TACACS are protocols that can be used for authentication, authorization and accounting. Enterprises often use one of these protocols to authenticate administrative users of network components.
The SB9 supports RADIUS and TACACS+ for the authentication of users which want to access the switch using the web interface, telnet or SSH.
It also supports these protocols for 802.1X, but since this protocol is rarely used in datacenter networks this feature is not discussed here.

4.4.2 Recommended Solution

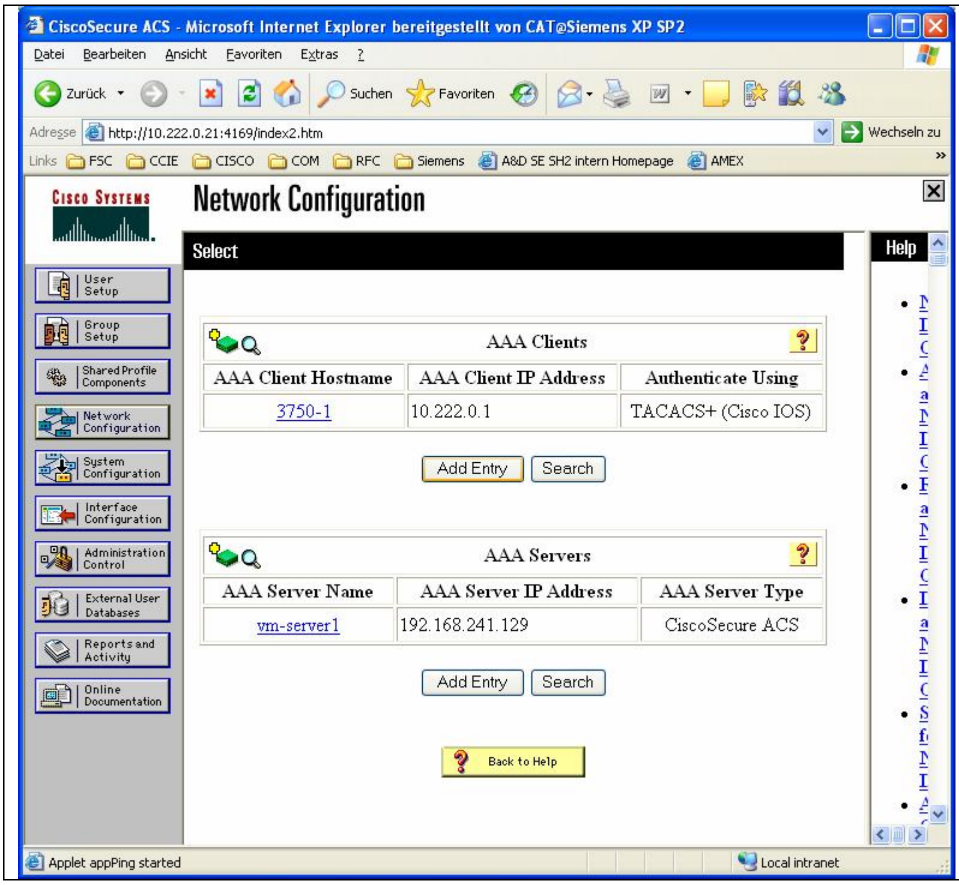
In most Cisco networks a Cisco Secure ACS is used as TACACS+ and RADIUS server. The protocol should be selected in compliance with company policy, so both configurations are described here.

4.4.3 Configuration of RADIUS

The following steps are necessary to integrate an SB9 into RADIUS authentication.

- 1. Prepare the ACS
- 2. Configure the SB9
- 3. Test the login

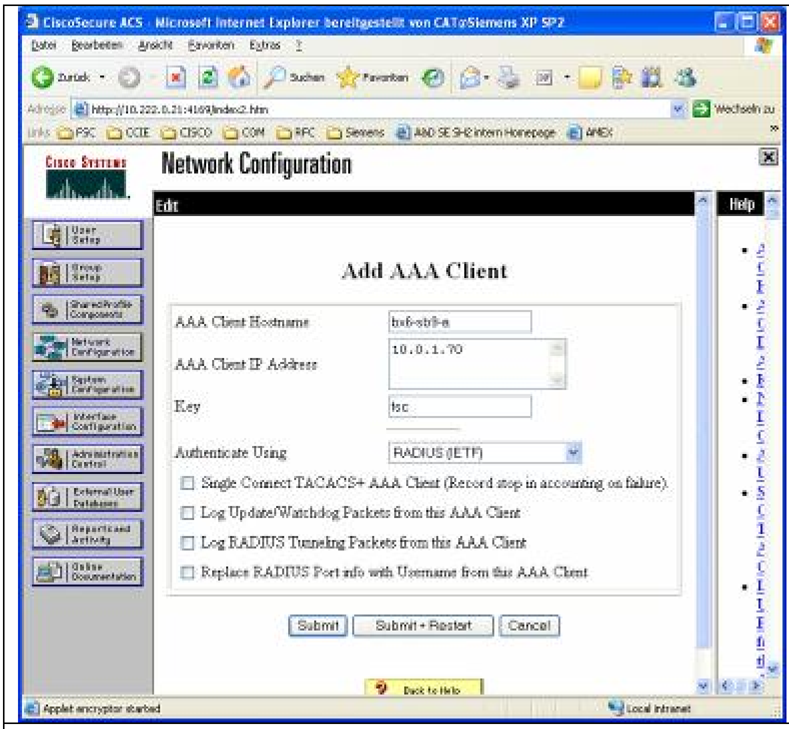
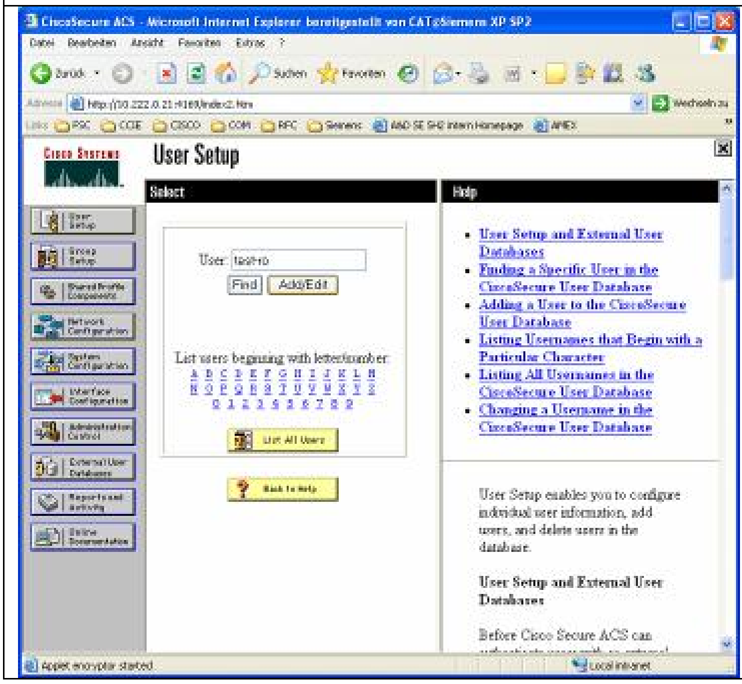
Step 1: Prepare the ACS
To prepare the ACS to be an authentication server for the SB9, log in to the web interface of the SB9 and perform the following configuration:

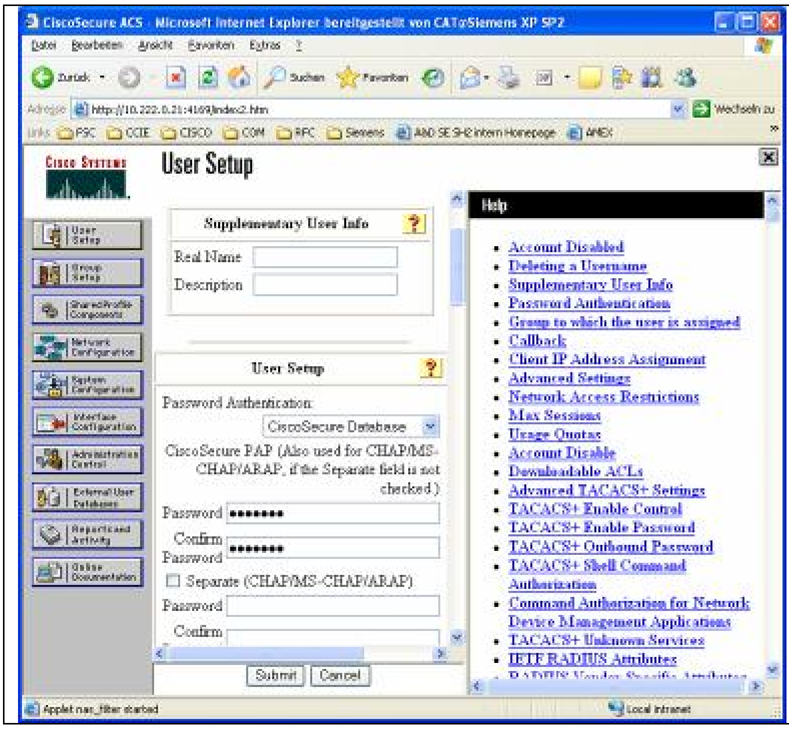
	Add the device using the button “Add Entry”

Network Configuration

AAA Clients		
AAA Client Hostname	AAA Client IP Address	Authenticate Using
3750-1	10.222.0.1	TACACS+ (Cisco IOS)

AAA Servers		
AAA Server Name	AAA Server IP Address	AAA Server Type
vm-server1	192.168.241.129	CiscoSecure ACS

 Network Configuration Edit Add AAA Client AAA Client Hostname: bx6-sb9-a AAA Client IP Address: 10.0.1.70 Key: fsc Authenticate Using: RADIUS (IETF) □ Single Connect TACACS+ AAA Client (Record stop in accounting on failure). □ Log Update/Watchdog Packets from this AAA Client □ Log RADIUS Tunneling Packets from this AAA Client □ Replace RADIUS Port info with Username from this AAA Client Submit / Submit + Restart / Cancel	Enter the name and IP address of the switch. Use RADIUS IETF, enter the shared key and press “Submit + Restart”
 User Setup Select User: test-ro Find / Add/Edit List users beginning with letter/number: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 List All Users Back to Help Help - User Setup and External User Databases - Finding a Specific User in the CiscoSecure User Database - Adding a User to the CiscoSecure User Database - Listing Usernames that Begin with a Particular Character - Listing All Usernames in the CiscoSecure User Database - Changing a Username in the CiscoSecure User Database User Setup enables you to configure individual user information, add users, and delete users in the database. User Setup and External User Databases Before Cisco Secure ACS can	Add the users to the ACS database, e.g. the user “test-ro”

 User Setup Supplementary User Info Real Name Description User Setup Password Authentication: CiscoSecure Database CiscoSecure PAP (Also used for CHAP/MS-CHAP/ARAP, if the Separate field is not checked.) Password ••••••• Confirm Password ••••••• ☐ Separate (CHAP/MS-CHAP/ARAP) Password Confirm Submit Cancel	Specify the user's password and press "Submit"

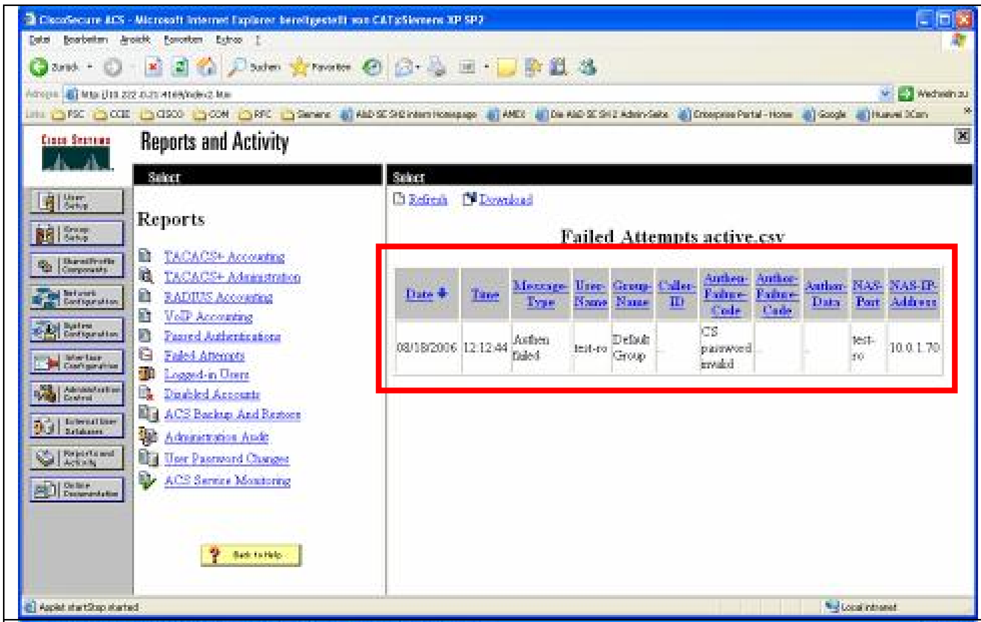
Step 2: Configure the SB9

```
! SB9 Configuration for RADIUS

! bind the authentication list to all users, which are
! not locally.
username defaultlogin RADIUS-LIST

! Enable RADIUS
radius accounting mode

radius-server host auth 10.222.0.21
radius-server key auth 10.222.0.21 7 8C55542626262626262626262626262626
radius-server primary 10.222.0.21

! Since all users which are authenticated by TACACS+ are read-only
! user, it's important to set the enable password which is not seen in
! the configuration file
enable passwd


!
! Create a authentication list
! authenticatio will be done agains RADIUS, if the server
! does not respond, it will be done locally
authentication login RADIUS-LIST radius reject

! bind the authentication list to all users, which are
! not locally.
username defaultlogin RADIUS-LIST

! Enable the authentication using server 10.222.0.21
radius-server host auth 10.222.0.21
! Set the share key for the authentication server
radius-server key auth 10.222.0.21 0 fsc
! Define the server as primary
radius-server primary 10.222.0.21
```

Step 3: Test the login

```
C:\> telnet bx6-sb9-b

! Test a login with correct username but wrong password
(bx6-sb9-a)
User:test-ro
Password: WRONG

! Test a login with correct username and password
User:test-ro
Password:test-ro
(bx6-sb9-a) >
```

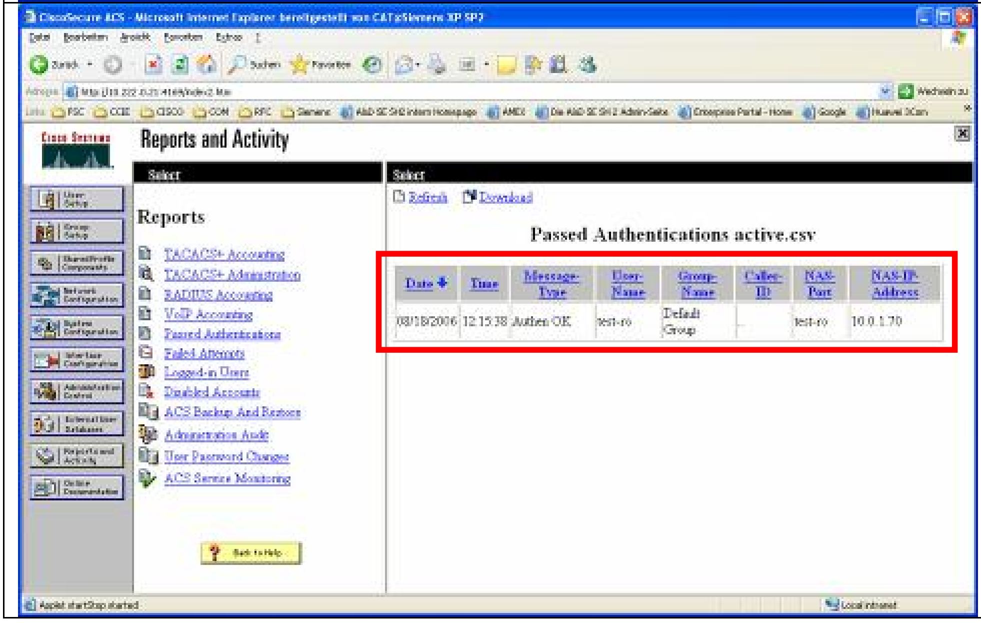
At the ACS you can see the failed and successful attempts:



View the failed attempts

Failed Attempts active.csv

Date	Time	Message-Type	User-Name	Group-Name	Caller-ID	Authen-Failure-Code	Author-Failure-Code	Author-Data	NAS-Port	NAS-IP-Address
08/18/2006	12:12:44	Authen failed	test-ro	Default Group	...	CS password invalid	...	...	test-ro	10.0.1.70



View the passed authentications

Passed Authentications active.csv

Date	Time	Message-Type	User-Name	Group-Name	Caller-ID	NAS-Port	NAS-IP-Address
08/18/2006	12:15:38	Authen OK	test-ro	Default Group	...	test-ro	10.0.1.70

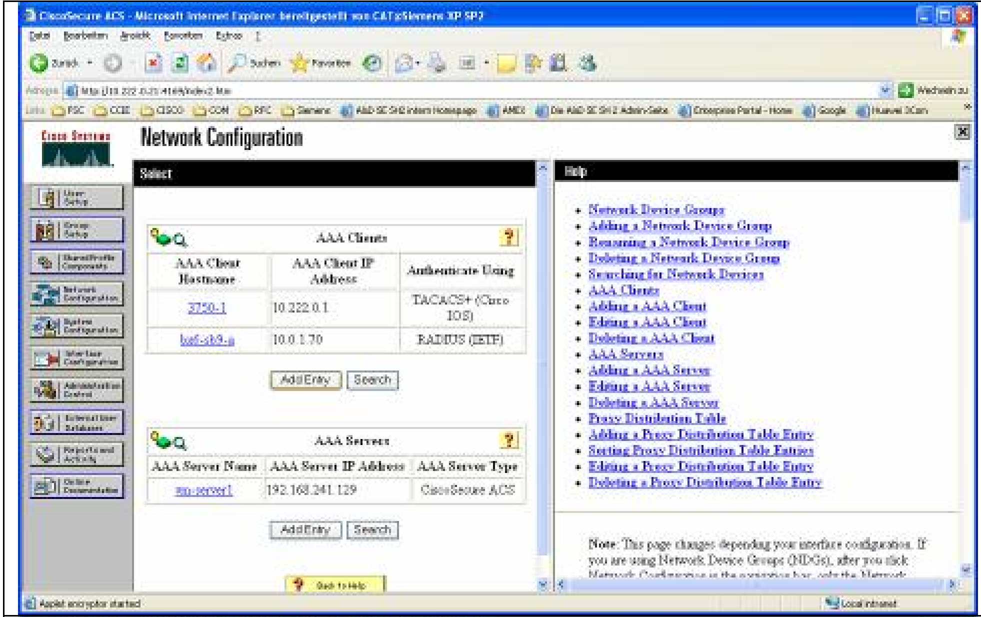
4.4.4 Configuration of TACACS

The following steps are necessary to integrate an SB9 into RADIUS authentication.

- 1. Prepare the ACS
- 2. Configure the SB9
- 3. Test the login

Step 1: Prepare the ACS

To prepare the ACS to be an authentication server for the SB9, login the web interface of the SB9 and do the following configurations:



Network Configuration

Select

AAA Clients

AAA Client Hostname	AAA Client IP Address	Authenticate Using
3750-1	10.222.0.1	TACACS+ (Cisco IOS)
bx6-sb9-a	10.0.1.70	RADIUS (IETF)

Add Entry | Search

AAA Servers

AAA Server Name	AAA Server IP Address	AAA Server Type
sm-server1	192.168.241.129	CiscoSecure ACS

Add Entry | Search

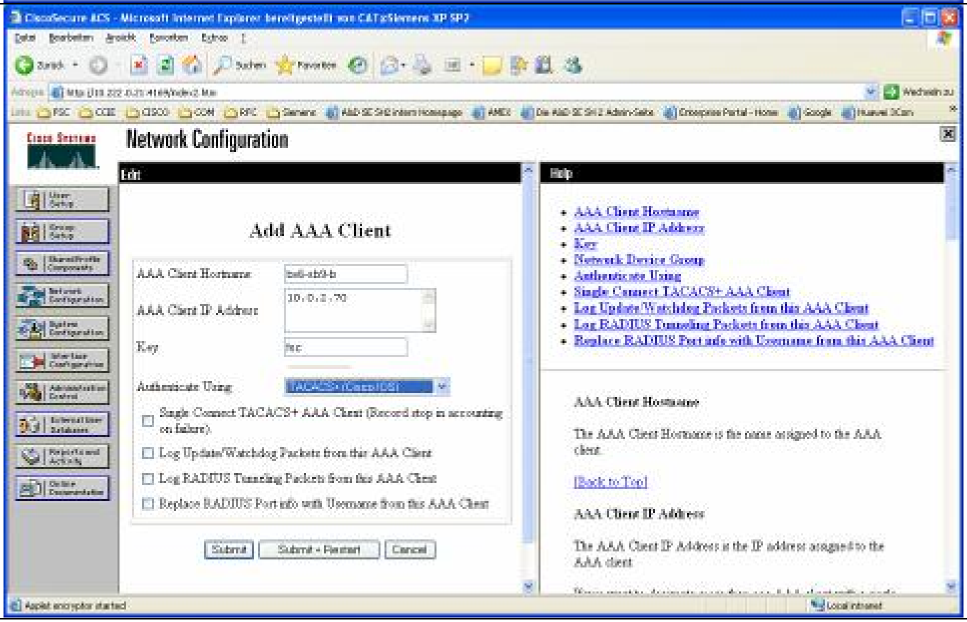
Back to Help

Help

- Network Device Groups
- Adding a Network Device Group
- Renaming a Network Device Group
- Deleting a Network Device Group
- Searching for Network Devices
- AAA Clients
- Adding a AAA Client
- Editing a AAA Client
- Deleting a AAA Client
- AAA Servers
- Adding a AAA Server
- Editing a AAA Server
- Deleting a AAA Server
- Proxy Distribution Table
- Adding a Proxy Distribution Table Entry
- Sorting Proxy Distribution Table Entries
- Editing a Proxy Distribution Table Entry
- Deleting a Proxy Distribution Table Entry

Note: This page changes depending your interface configuration. If you are using Network Device Groups (NDGs), after you click Network Configuration in the navigation bar, only the Network

To add the device, press “Add Entry”



Network Configuration

Edit

Add AAA Client

AAA Client Hostname: bx6-sb9-b

AAA Client IP Address: 10.0.2.70

Key: fsc

Authenticate Using: TACACS+ (Cisco IOS)

- ☐ Single Connect TACACS+ AAA Client (Record stop in accounting on failure).
- ☐ Log Update/Watchdog Packets from this AAA Client
- ☐ Log RADIUS Tunneling Packets from this AAA Client
- ☐ Replace RADIUS Port info with Username from this AAA Client

Submit | Submit + Restart | Cancel

Help

- AAA Client Hostname
- AAA Client IP Address
- Key
- Network Device Group
- Authenticate Using
- Single Connect TACACS+ AAA Client
- Log Update/Watchdog Packets from this AAA Client
- Log RADIUS Tunneling Packets from this AAA Client
- Replace RADIUS Port info with Username from this AAA Client

AAA Client Hostname

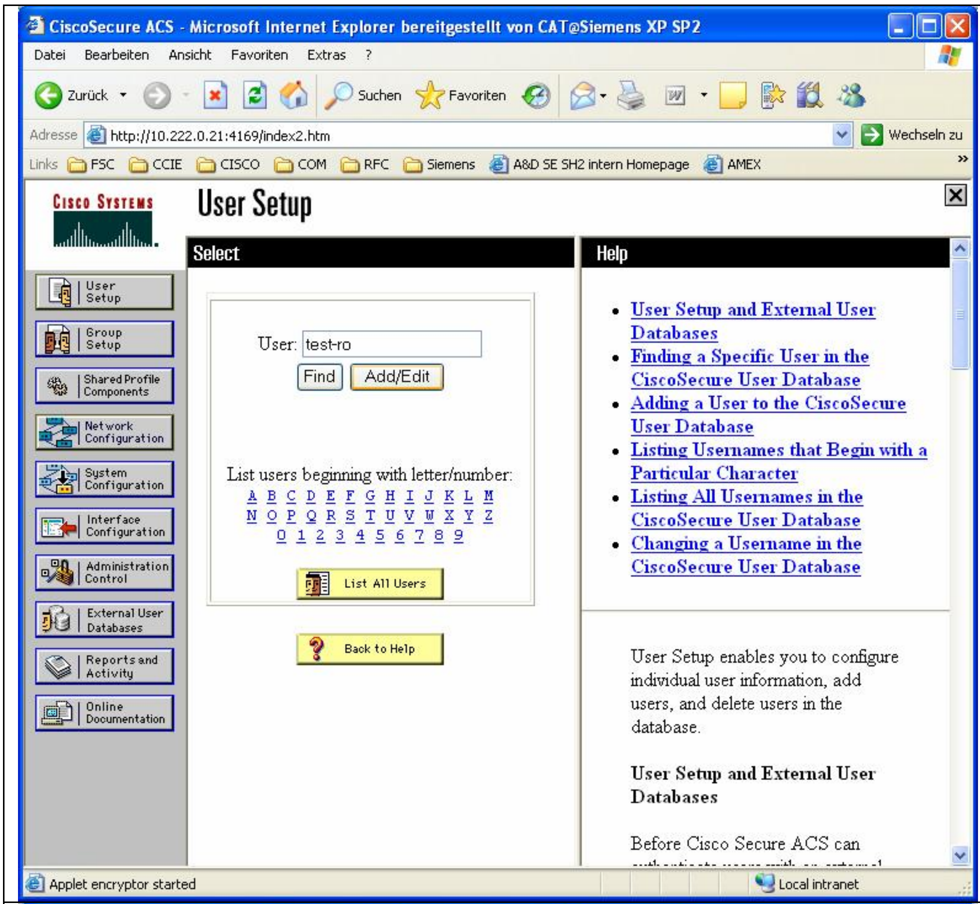
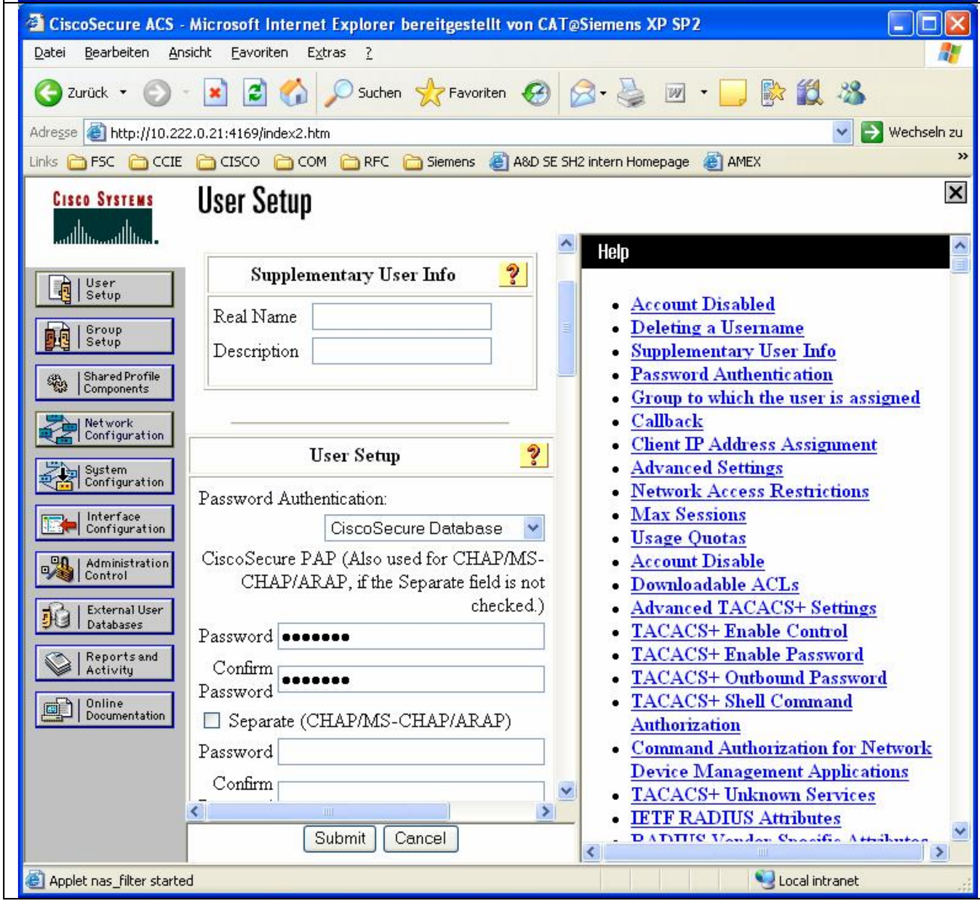
The AAA Client Hostname is the name assigned to the AAA client.

[Back to Top]

AAA Client IP Address

The AAA Client IP Address is the IP address assigned to the AAA client.

Enter the name, IP Address and the shared key for the device, select TACACS+ and press “Submit + Restart”.

 CiscoSecure ACS - Microsoft Internet Explorer bereitgestellt von CAT@Siemens XP SP2 Datei Bearbeiten Ansicht Favoriten Extras ? Zurück Suchen Favoriten Adresse http://10.222.0.21:4169/index2.htm Wechseln zu Links FSC CCIE CISCO COM RFC Siemens A&D SE SH2 intern Homepage AMEX CISCO SYSTEMS User Setup Group Setup Shared Profile Components Network Configuration System Configuration Interface Configuration Administration Control External User Databases Reports and Activity Online Documentation Select Find Add/Edit List users beginning with letter/number: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 List All Users Back to Help Help Applet encryptor started Local intranet User Setup User: test-ro - User Setup and External User Databases - Finding a Specific User in the CiscoSecure User Database - Adding a User to the CiscoSecure User Database - Listing Usernames that Begin with a Particular Character - Listing All Usernames in the CiscoSecure User Database - Changing a Username in the CiscoSecure User Database User Setup enables you to configure individual user information, add users, and delete users in the database. **User Setup and External User Databases** Before Cisco Secure ACS can	Add the users to the ACS database, e.g. the user "test-ro"
 CiscoSecure ACS - Microsoft Internet Explorer bereitgestellt von CAT@Siemens XP SP2 Datei Bearbeiten Ansicht Favoriten Extras ? Zurück Suchen Favoriten Adresse http://10.222.0.21:4169/index2.htm Wechseln zu Links FSC CCIE CISCO COM RFC Siemens A&D SE SH2 intern Homepage AMEX CISCO SYSTEMS User Setup Group Setup Shared Profile Components Network Configuration System Configuration Interface Configuration Administration Control External User Databases Reports and Activity Online Documentation Submit Cancel Help Applet nas_filter started Local intranet User Setup **Supplementary User Info** Real Name Description **User Setup** Password Authentication: CiscoSecure Database CiscoSecure PAP (Also used for CHAP/MS-CHAP/ARAP, if the Separate field is not checked.) Password ••••••• Confirm Password ••••••• □ Separate (CHAP/MS-CHAP/ARAP) Password Confirm - Account Disabled - Deleting a Username - Supplementary User Info - Password Authentication - Group to which the user is assigned - Callback - Client IP Address Assignment - Advanced Settings - Network Access Restrictions - Max Sessions - Usage Quotas - Account Disable - Downloadable ACLs - Advanced TACACS+ Settings - TACACS+ Enable Control - TACACS+ Enable Password - TACACS+ Outbound Password - TACACS+ Shell Command Authorization - Command Authorization for Network Device Management Applications - TACACS+ Unknown Services - IETF RADIUS Attributes	Specify the user's password and press "Submit"

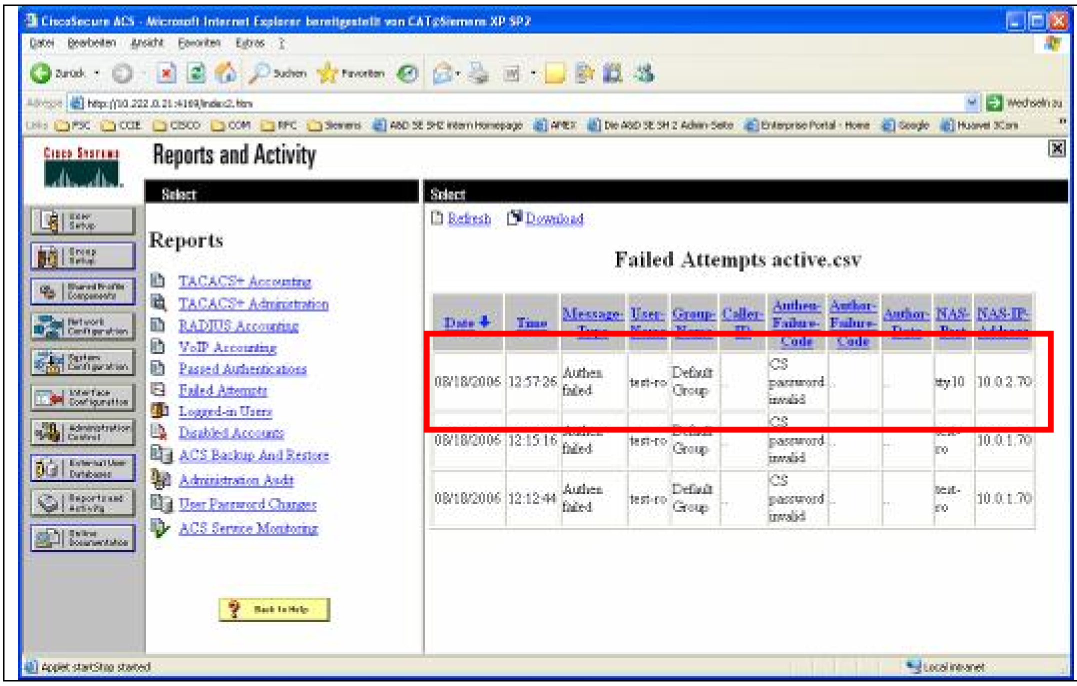
Step 2: Configure the SB9

```
! SB9 Configuration for TACACS+
!
! Create a authentication list
! authenticatio will be done agains TACACS, if the server
! does not respond, it will be done locally
authentication login TACACS tacacs local reject
!
! bind the authentication list to all users, which are
! not locally.
username defaultlogin TACACS

! Enable TACACS
Tacacs
! Set the shared key for server 1
tacacs key 1 0 fsc
! Set the IP address of server 1
tacacs server-ip 1 10.222.0.21
! Define the server 1 as master
tacacs mode 1 master 1

! Since all users which are authenticated by TACACS+ are read-only
! user, it’s important to set the enable password which is not seen in
! the configuration file
enable passwd
```

Step 3: Test the login

```
C:\> telnet bx6-sb9-b

! Test a login with correct username but wrong password
(bx6-sb9-b)
User:test-ro
Password: WRONG

! Test a login with correct username and password
User:test-ro
Password:test-ro
(bx6-sb9-b) >
```

At the ACS you can see the failed and successful attempts:



Reports

- TACACS+ Accounting
- TACACS+ Administration
- RADIUS Accounting
- VoIP Accounting
- Passed Authentications
- Failed Attempts
- Logged-in Users
- Disabled Accounts
- ACS Backup And Restore
- Administration Audit
- User Password Changes
- ACS Service Monitoring

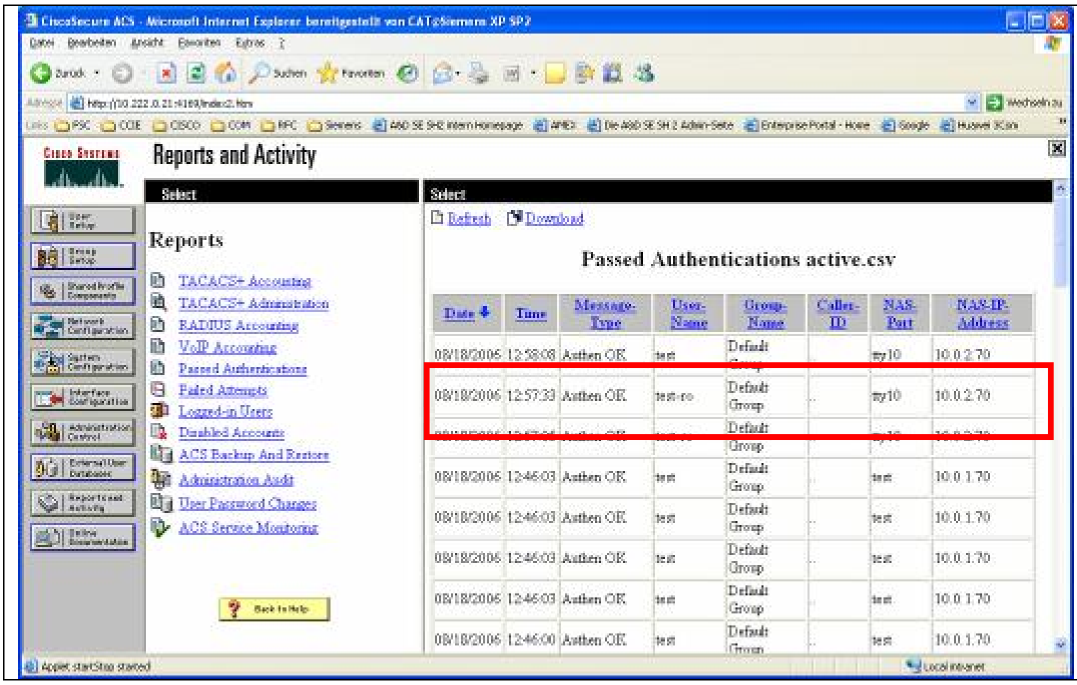
Select

Refresh Download

Failed Attempts active.csv

Date	Time	Message-Type	User-Name	Group-Name	Caller-ID	Authen-Failure-Code	Author-Failure-Code	Author-Data	NAS-Port	NAS-IP-Address
08/18/2006	12:57:26	Authen failed	test-ro	Default Group	...	CS password invalid	...	...	tty10	10.0.2.70
08/18/2006	12:15:16	Authen failed	test-ro	Default Group	...	CS password invalid	...	...	test-ro	10.0.1.70
08/18/2006	12:12:44	Authen failed	test-ro	Default Group	...	CS password invalid	...	...	test-ro	10.0.1.70

View the failed attempts



Reports

- TACACS+ Accounting
- TACACS+ Administration
- RADIUS Accounting
- VoIP Accounting
- Passed Authentications
- Failed Attempts
- Logged-in Users
- Disabled Accounts
- ACS Backup And Restore
- Administration Audit
- User Password Changes
- ACS Service Monitoring

Passed Authentications active.csv

Date	Time	Message-Type	User-Name	Group-Name	Caller-ID	NAS-Port	NAS-IP-Address
08/18/2006	12:58:08	Authen OK	test	Default Group	..	tty10	10.0.2.70
08/18/2006	12:57:33	Authen OK	test-ro	Default Group	..	tty10	10.0.2.70
08/18/2006	12:57:04	Authen OK	test-ro	Default Group	..	tty10	10.0.2.70
08/18/2006	12:46:03	Authen OK	test	Default Group	..	test	10.0.1.70
08/18/2006	12:46:03	Authen OK	test	Default Group	..	test	10.0.1.70
08/18/2006	12:46:03	Authen OK	test	Default Group	..	test	10.0.1.70
08/18/2006	12:46:03	Authen OK	test	Default Group	..	test	10.0.1.70
08/18/2006	12:46:00	Authen OK	test	Default Group	..	test	10.0.1.70

View the passed authentications

4.5 Cisco Discovery Protocol

4.5.1 Introduction

The Cisco Discovery Protocol (CDP) is intended to provide a way of finding out about the physical cabling of a switch environment. It is often implemented in data center networks to give the administrator additional help with troubleshooting and documentation.

In some situations CDP will be a security issue, since it would also give a hacker interesting information about the network.

4.5.2 Recommended Solution

In normal solutions CDP will not represent a security risk. In high security areas or hosted environments, the administrator may decide to disable CDP. In this case we recommend you to disable CDP at the access ports to the server.

4.5.3 Configuration of CDP

The following steps are necessary to disable CDP at the access ports.

- Step 1: Configure the SB9
- Step 2: Check the configuration

Step 1: Configure the SB9

```
! SB9 CDP configuration
!
! Disable CDP
interface range 0/1 - 0/10
no cdp run
!
```

Step 2: Check the configuration

```
 (bx6-sb9-a) #show cdp

Global CDP information
CDP Admin mode................................. Enable
CDP Hold Time (sec)............................ 180
CDP Transmit Interval (sec).................... 60

 Port    CDP
------ -------
0/1    Disable
0/2    Disable
0/3    Disable
0/4    Disable
0/5    Disable
0/6    Disable
0/7    Disable
0/8    Disable
0/9    Disable
0/10   Disable
```

```
0/11   Enable
0/12   Enable
0/13   Enable
0/14   Enable
0/15   Enable
0/16   Enable
```

4.6 Port Monitoring

4.6.1 Introduction

When a network analyzer is used in a switched network, a special switch port configuration is needed in order to copy frames from a specified port to the analyzer port.
This feature is called the “port-monitor” at the SB9 or the “port-mirror” for Cisco switches. The SB9 supports one monitor session with multiple source interfaces, and one destination interface to which the network analyzer is connected. At present port-mirror is not supported on port-channel interfaces.

4.6.2 Configuration of Port Monitoring

The following steps are necessary in order to configure a port monitor session.

- Step 1: Configure the SB9
- Step 2: Check the configuration

Step 1: Configure the SB9

```
! Stop an existing monitor session if applicable
no port-monitor session 1

! Start a new monitor session
port-monitor session 1 source interface 0/1
port-monitor session 1 destination  interface 0/4
port-monitor session 1 mode both
```

Step 2: Check the configuration

```
(bx6-sb9-a) #show port-monitor session 1

Session ID   Admin Mode   Dest. Port    Source Port
----------   ----------   ----------   -------------
1            Enable-Both  0/4          0/1
```

4.7 Further information in the Internet:

PRIMERGY servers
www.fujitsu-siemens.com/primergy

Published by:
FSC EP ESB ST PRIMERGY
Enterprise Server Business, Support & Trainings

Extranet:
http://extranet.fujitsu-siemens.com/primergy
Internet:
http://www.fujitsu-siemens.com/primergy